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Central Radio Propagation Laboratory

IONOSPHERIC PREDICTIONS

for

June

1964

TB 11-499-15/TO 31-3-28

U. S. DEPARTMENT of COMMERCE
National Bureau of Standards
Number 15/Issued March 1964

U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, Secretary

NATIONAL BUREAU OF STANDARDS
A. V. Astin, Director

Central Radio Propagation Laboratory

Ionospheric Predictions

for June 1964

Number 15

Issued

March 1964

[Formerly "Basic Radio Propagation Predictions," CRPL Series D.]

The CRPL Ionospheric Predictions are issued monthly as an aid in determining the best sky-wave frequencies over any transmission path, at any time of day, for average conditions for the month. Issued three months in advance, each issue provides tables of numerical coefficients that define the functions describing the predicted worldwide distribution of foF2 and M(3000)F2 and maps for each even hour of universal time of MUF(Zero)F2 and MUF(4000)F2.

NOTE: Department of Defense personnel see back cover.

Use of funds for printing this publication approved by the Director of the Bureau of the Budget (June 19, 1961).

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402. Price 15 cents.

Annual subscription (12 issues) $1.50 (50 cents additional for foreign mailing).

National Bureau of Standards

The functions of the National Bureau of Standards are set forth in an Act of Congress, March 3, 1901, as amended. These include the development and maintenance of the national standards of measurement and the provision of means and methods for making measurements consistent with these standards; the determination of physical constants and properties of materials; the development of methods and instruments for testing materials, devices, and structures; advisory services to government agencies on scientific and technical problems; invention and development of devices to serve special needs of the Government; and the development of standard practices, codes, and specifications. The work includes basic and applied research, development, engineering, instrumentation, testing, evaluation, calibration services, and various consultation and information services. The Bureau also serves as the Federal technical research center in a number of specialized fields.

Central Radio Propagation Laboratory

The Central Radio Propagation Laboratory at Boulder, Colorado, is the central agency of the Federal Government for the collection, analysis, and dissemination of information on propagation of radio waves at all frequencies along the surface of the earth, in the atmosphere, and in space, and performs scientific studies looking toward new techniques for the efficient use and conservation of the radio spectrum. To carry out this responsibility, the CRPL—

1. Acts as the central agency for the conduct of basic research on the nature of radio waves, the pertinent properties of the media through which radio waves are transmitted, the interaction of radio waves with those media, and on the nature of radio noise and interference effects. This includes compilation of reports by other foreign and domestic agencies conducting research in this field and furnishing advice to government and nongovernment groups conducting propagation research.

2. Performs studies of specific radio propagation mechanisms and performs scientific studies looking toward the development of techniques for efficient use and conservation of the radiofrequency spectrum as part of its regular program or as requested by other government agencies. In an advisory capacity, coordinates studies in this area undertaken by other government agencies.

3. Furnishes advisory and consultative service on radio wave propagation, on radiofrequency utilization, and on radio systems problems to other organizations within the United States, public and private.

4. Prepares and issues predictions of radio wave propagation and noise conditions and warnings of disturbances in these conditions.

5. Acts as a central repository for data, reports, and information in the field of radio wave propagation.

6. Performs scientific liaison and exchanges data and information with other countries to advance knowledge of radio wave propagation and interference phenomena and spectrum conservation techniques, including that liaison required by international responsibilities and agreements.

Introduction

The "Central Radio Propagation Laboratory Ionospheric Predictions" is the successor to the former "Basic Radio Propagation Predictions," CRPL Series D. To make effective use of these predictions, National Bureau of Standards Handbook 90, "Handbook for CRPL Ionospheric Predictions Based on Numerical Methods of Mapping," should be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402, price 40 cents. This Handbook includes required additional data, nomographs and graphical aids, as well as methods for the use of the predictions. The Handbook supersedes the obsolete NBS Circular 465.

The basic prediction appears in tables 1 and 2, presenting predicted coefficients for foF2 and M(3000)F2 defining the numerical map functions describing the predicted worldwide variation of these characteristics. With additional auxiliary information, these coefficients may be used as input data for electronic computer programs solving specific high frequency propagation problems. The basic equations, their interpretation, and methods of using the numerical maps are described in two papers by W. B. Jones and R. M. Gallet, "The Representation of Diurnal and Geographic Variations of Ionospheric Data by Numerical Methods," Volume 66D, Number 4, July–August 1962, pages 419–438, and "Methods for Applying Numerical Maps of Ionospheric Characteristics," Volume 66D, Number 6, November–December 1962, pages 649–662, both in the Journal of Research of the National Bureau of Standards, Section D. Radio Propagation. The predicted numerical map coefficients of tables 1 and 2 may be purchased in the form of a tested set of punched cards. Write to the Prediction Services Section, Central Radio Propagation Laboratory, National Bureau of Standards, Boulder, Colorado, to arrange for the purchase of the set of punched cards and for further information and assistance in the application of computer methods and numerical prediction maps to specific propagation problems.

The graphical prediction maps, derived from the basic prediction, are provided for those unable to make use of an electronic computer. Figures 1 to 12 present world maps of MUF (Zero) F2 and MUF(4000)F2 for each even hour of universal time. Figures 13 to 16 present the same predictions for hours 00 and 12 universal time for the North and South Polar areas. Predicted polar maps for each even hour of universal time may be obtained by special arrangements with the Central Radio Propagation Laboratory. Handbook 90 describes methods for including regular E–F1 propagation. Figure A is a graph of predicted and observed Zürich sunspot numbers which shows the recent trend of solar activity. Table A lists observed and predicted Zürich smoothed relative sunspot numbers and includes the sunpot number used for the current prediction.

Members of the U.S. Army, Navy, or Air Force desiring the Handbook and the Ionospheric Predictions should send requests to the proper service address; for the Navy: The Director, Naval Communications, Department of the Navy, Washington, D.C., 20350; for the Air Force: Directorate of Command Control and Communications, Headquarters, United States Air Force, Washington, D.C., 20330. Attention: AFOCCAA. Army personnel should refer to the Handbook as TM-11–499 and to the monthly predictions as TB 11–499–( ), predictions for the month of June 1964 being distributed in March 1964 and designated TB 11–499–(15), and should requisition these through normal publication channels.

Information concerning the theory of radio wave propagation and such important problems as absorption, field intensity, lowest useful high frequencies, etc., is given in National Bureau of Standards Circular 462, "Ionospheric Radio Propagation." A revised work is in preparation which will be announced in the Ionospheric Prediction series when available. Additional information about radio noise may be found in C.C.I.R. Report Number 65, "Revision of Atmospheric Noise Data," International Telecommunication Union, Geneva, 1957.

Reports to this Laboratory of experience with these predictions would be appreciated. Correspondence should be addressed to the Prediction Services Section, Central Radio Propagation Laboratory, National Bureau of Standards, Boulder, Colorado.

Table A

Observed and Predicted Zurich Smoothed Relative Sunspot Numbers

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1952	43	42	39	36	34	32	31	29	28	28	27	26
	(53)	(51)	(52)	(52)	(52)	(52)	(51)	(49)	(46)	(43)	(38)	(33)
1953	24	22	20	19	17	15	13	12	11	10	9	7
	(30)	(29)	(27)	(24)	(22)	(21)	(20)	(18)	(18)	(17)	(16)	(15)
1954	6	6	4	3	4	4	5	7	8	8	10	12
	(14)	(12)	(11)	(10)	(10)	(9)	(8)	(8)	(8)	(10)	(10)	(11)
1955	14	16	20	23	29	35	40	46	55	64	73	81
	(12)	(14)	(14)	(13)	(16)	(18)	(22)	(27)	(30)	(31)	(35)	(42)
1956	89	98	109	119	127	137	146	150	151	156	160	164
	(48)	(53)	(60)	(68)	(77)	(89)	(95)	(105)	(119)	(135)	(147)	(150)
1957	170	172	174	181	186	188	191	194	197	200	201	200
	(150)	(150)	(150)	(150)	(150)	(150)	(150)	(150)	(150)	(150)	(150)	(150)
1958	199	201	201	197	191	187	185	185	184	182	181	180
	(150)	(150)	(150)	(150)	(150)	(150)	(150)	(150)	(150)	(150)	(150)	(150)
1959	179	177	174	169	165	161	156	151	146	141	137	132
	(150)	(150)	(150)	(150)	(146)	(143)	(141)	(142)	(141)	(139)	(137)	(137)
1960	129	125	122	120	117	114	109	102	98	93	88	84
	(136)	(135)	(133)	(130)	(125)	(120)	(118)	(115)	(110)	(108)	(105)	(100)
1961	80	75	69	64	60	56	53	52	52	51	50	49
	(100)	(90)	(90)	(90)	(85)	(85)	(80)	(75)	(70)	(70)	(65)	(60)
1962	45	42	40	39	39	38	36	34	32	31	30	30
	(60)	(50)	(48)	(45)	(42)	(37)	(34)	(31)	(29)	(28)	(27)	(34)
1963	29	30	30	29	29	27						
	(31)	(28)	(26)	(25)	(25)	(25)	(23)	(21)	(20)	(18)	(18)	(17)
1964												
	(17)	(17)	(17)	(17)	(17)	(17)*						

Note: Final numbers are listed through June 1962, the succeeding values being based on provisional data. The predicted numbers are in parentheses.

* Number used for predictions in this issue.

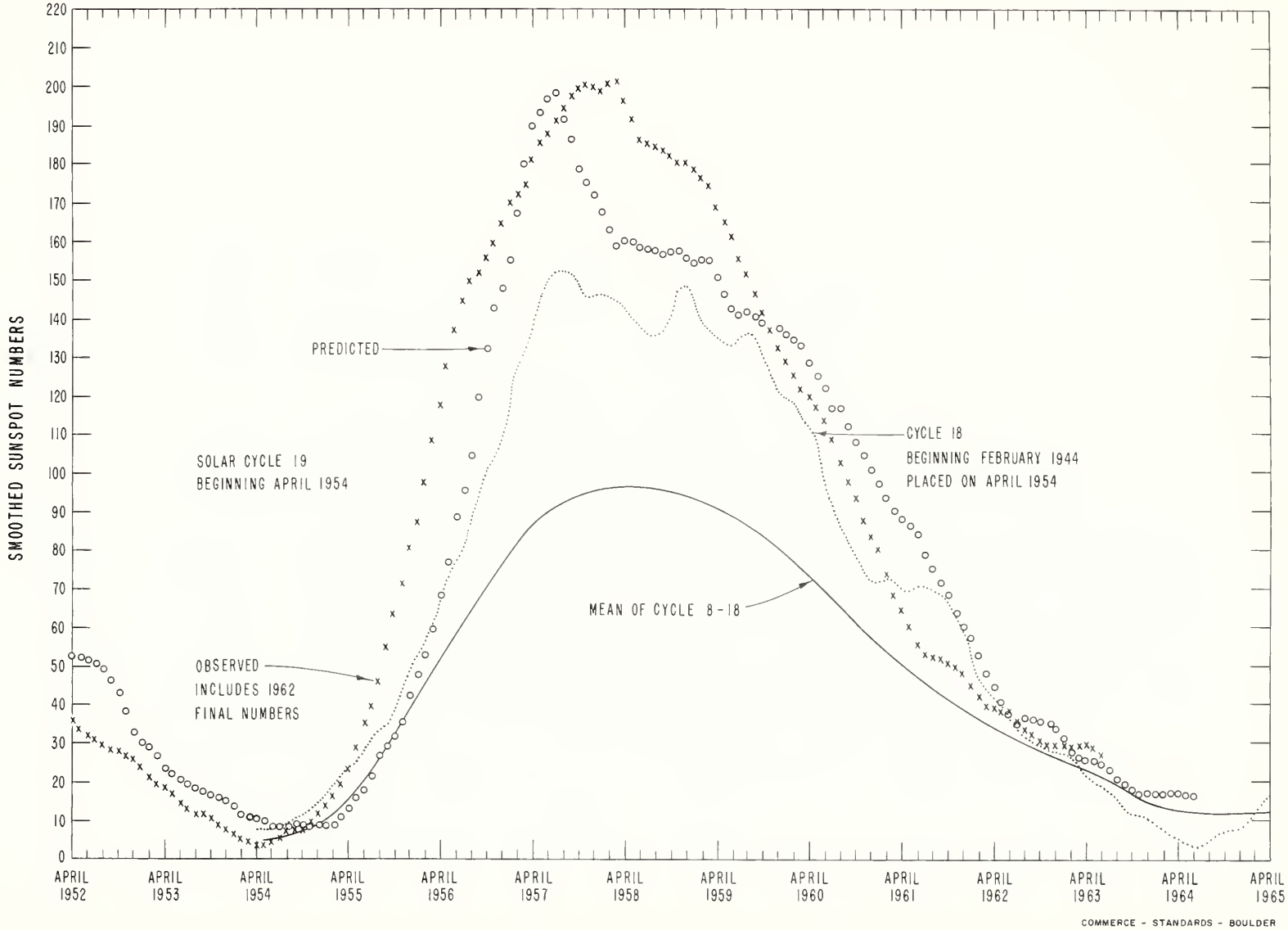

FIG. A. PREDICTED AND OBSERVED SUNSPOT NUMBERS

TABLE I

TIME VARIATION

GEOGRAPHICAL VARIATION

Harmonic		0	1		2		3		4	
	S / K	0	1		2		3		4	
I	0	5.8481533E 00	1.5549703E 00	2.1194851E 00	-4.1224886E-01	7.1844241E-02	-4.0411955E-01	-4.5370867E-01	2.5148444E-01	-7.5291489E-02
	1	1.1668313E 00	1.4397304E 00	-2.0386969E 00	2.6807837E-01	-1.4691775E 00	2.8478470E-01	-2.9600460E-02	-4.1833355E-02	5.6418258E-01
	2	-6.4053355E 00	1.7175563E 00	1.5862422E 00	4.5683483E 00	-3.2889099E 00	1.8620833E 00	-3.4642624E-02	-1.3958742E 00	2.6318401E 00
	3	1.4764515E 01	7.4705461E 00	2.4443371E 01	4.4232287E 00	5.4422724E 00	-1.9448214E 00	1.4956760E 00	3.2152339E 00	4.6267868E-01
	4	3.1671314E 01	-4.2748180E 01	-4.3615719E 01	-8.6170994E 00	3.7974282E 01	-9.7072220E 00	9.6834334E 00	1.4372659E 00	-2.3435965E 01
	5	-8.9989611E 01	-7.4883531E 01	-1.1852547E 02	-4.8313483E 01	-6.6155899E 00	6.7770863E-01	-8.0639271E 00	-1.0738146E 01	-1.3622364E 01
	6	-1.3617719E 02	1.4104427E 02	1.4875963E 02	-3.8605344E 01	-1.5454497E 02	3.9904195E 01	-3.3682725E 01	1.8081588E 01	7.5403453E 01
	7	1.9150655E 02	1.8777256E 02	2.3933934E 02	1.2028786E 02	-8.3172346E 00	1.7386123E 01	2.1012390E 01	1.1355146E 01	3.8423443E 01
	8	2.6901704E 02	-2.0543011E 02	-2.2044626E 02	1.3954710E 02	2.9207214E 02	-7.6036883E 01	5.2448834E 01	-6.6837803E 01	-1.1644198E 02
	9	-1.7491040E 02	-1.9141122E 02	-2.1397161E 02	-1.1624914E 02	2.2750592E 01	-3.2504942E 01	-2.4757909E 01	-2.9327651E 00	-4.1453952E 01
	10	-2.4059536E 02	1.4262587E 02	1.5224345E 02	-1.4991923E 02	-2.5826116E 02	6.5062087E 01	-4.0176505E 01	8.1288745E 01	8.8493160E 01
	11	5.8220361E 01	6.9590420E 01	7.0555933E 01	3.9539432E 01	-1.1928520E 01	1.6142050F 01	1.0382775E 01	-8.5867974E-01	1.5674251E 01
	12	8.0038291E 01	-3.8729375E 01	-4.0355289E 01	5.3543211E 01	8.6038971E 01	-2.0691400E 01	1.2250403E 01	-3.2867397E 01	-2.6605365E 01
II	13	9.7432020E-02	5.7982753E-02	1.7367470E-01	1.9449899E-02	7.1091687E-03	3.0227959E-02	5.6759353E-02	6.0024037E-02	1.6703160E-02
	14	7.8077006E-02	-5.5999665E-02	6.0991006E-01	-5.9021787E-02	8.3287877E-02	-1.0518945E-01	-3.2473716E-02	7.2050768E-02	-1.5049566E-02
	15	-1.0914935E-01	-5.9582638E-02	1.1555264E 00	-6.8179386E-01	-5.8466651E-02	-6.5169476E-02	-5.4000722E-01	-2.2659653E-01	-7.5469972E-02
	16	-2.3144802E 00	-1.4113456E 00	-1.7656604E 00	-4.3786831E 00	-1.6339707E 00	-5.2890522E-01	-3.1631185E-01	7.0280589E-01	-5.5812011E-01
	17	-1.2382690E 01	-4.6418655E 00	-3.4412124E 00	1.5554975E 00	-6.7271585E-01	6.2989286E-02	-3.3656083E 00	-3.5248956E 00	1.5041285E-01
	18	-1.3933931E 01	-9.0669248E 00	-9.5565758E 00	-3.3561862E 00	-1.2961720E 00	3.5389903E 00	1.3011394E 00	6.6858118E-01	4.6895590E-01
	19	9.4573134E 00	5.1283848E 00	-1.6528866E 01	7.4704714E 00	4.0995372E-01	1.8212102E 00	7.5766224E 00	2.7195079E 00	2.7119294E-01
	20	6.0288454E 01	4.1949430E 01	3.5001935E 01	6.0593585E 01	2.3401330E 01	2.6841938E 00	1.7606192E 00	-7.4227835E 00	1.0026112E 01
	21	1.4514045E 02	6.4314861E 01	1.5486728E 01	-2.7877568E 01	9.9947623E 00	-1.5082532E 00	3.5261694E 01	3.4103626E 01	-6.8282082E 00
	22	1.3192618E 02	9.0537735E 01	3.5702585E 01	5.1469217E 01	5.6049407E 00	-1.6846643E 01	-1.3933935E 01	-2.2180277E 01	-5.2969203E 00
	23	-4.8745418E 01	-5.0799907E 01	6.3152661E 01	-3.6434397E 01	-1.1015222E 00	-9.7836757E 00	-2.9255074E 01	-1.0040871E 01	1.2136988E 00
	24	-3.1996343E 02	-2.1939582E 02	-1.3237682E 02	-2.8553966E 02	-1.1107692E 02	-9.5360045E 00	-7.7471303E 00	3.1740090E 01	-5.4761934E 01
	25	-6.5101839E 02	-2.9620925E 02	-4.4996538E 00	1.4302551E 02	-3.7974551E 01	9.6193608E 00	-1.4448915E 02	-1.3292949E 02	4.8449969E 01
	26	-5.0224461E 02	-3.5670086E 02	-5.6796995E 01	-2.1968349E 02	-1.1247397E 01	2.9850872E 01	6.3461552E 01	1.2205007E 02	2.2964259E 01
	27	1.0009837E 02	1.6845454E 02	-1.0039259E 02	8.0010223E 01	-1.7785668E-01	2.2430920E 01	4.9046838E 01	1.5535527E 01	-5.8384965E 00
	28	7.2111276E 02	4.4698035E 02	1.6036232E 02	5.9814691E 02	2.3563497E 02	2.1014608E 01	1.4475227E 01	-6.1934079E 01	1.2362518E 02
	29	1.3541199E 03	6.0744709E 02	-5.7946961E 01	-3.1867483E 02	5.2535585E 01	-2.5926933E 01	2.7662831E 02	2.4987408E 02	-1.2674347E 02
	30	9.3666826E 02	6.5779662E 02	4.0494014E 01	4.1486046E 02	2.1950855E 01	-2.2408185E 01	-1.3458480E 02	-2.7146648E 02	-4.4584219E 01
	31	-1.0168053E 02	-2.2310061E 02	7.0953043E 01	-7.5885604E 01	4.2344060E 00	-2.3659260E 01	-3.8503508E 01	-1.0529194E 01	8.4867431E 00
	32	-7.2745073E 02	-3.9985268E 02	-3.1928368E 01	-5.7466063E 02	-2.2485962E 02	-2.1477045E 01	-1.0108205E 01	5.3761161E 01	-1.2304921E 02
	33	-1.3071070E 03	-5.7274061E 02	7.6691339E 01	3.1987866E 02	-2.5320971E 01	2.9573729E 01	-2.4910571E 02	-2.2361969E 02	1.4013602E 02
	34	-8.4580989E 02	-5.6626083E 02	-1.9382179E 01	-3.6802599E 02	-2.9741040E 01	8.9512712E 00	1.3081479E 02	2.6772539E 02	3.9843337E 01
	35	4.2743934E 01	1.0325834E 02	-1.8473154E 01	2.4683608E 01	-3.9497572E 00	8.8377627E 00	1.1817458E 01	2.6148563E 00	-4.1514093E 00
	36	2.6863694E 02	1.3123889E 02	-3.1543457E 01	2.0665658E 02	7.8423922E 01	7.9021809E 00	1.9574790E 00	-1.6693474E 01	4.4776846E 01
	37	4.7265893E 02	2.0091699E 02	-2.4475387E 01	-1.1731361E 02	1.9146746E 00	-1.1700363E 01	8.5046313E 01	7.6090124E 01	-5.5600660E 01
	38	2.9483049E 02	1.8458488E 02	1.0496630E 01	1.2502247E 02	1.4963008E 01	-3.2965921E 00	-4.6911429E 01	-9.7031920E 01	-1.3440991E 01
III	39	6.1251646E-02	-7.0849791E-02	1.6645896E-02	-4.2158043E-02	1.5890686E-02	-5.5470102E-03	-9.0213356E-03	2.1906370E-02	-5.0578311E-03
	40	7.1434316E-02	8.4090326E-02	-2.3448593E-02	1.5610910E-02	-2.4830163E-02	-1.9596665E-03	2.0377877E-02	3.6349387E-02	1.3729353E-02
	41	1.7479574E-02	6.5959664E-01	4.8984706E-02	1.4255498E-01	1.2130361E-01	-1.2422035E-02	-1.6237679E-03	-2.3237426E-01	-2.4697408E-03
	42	2.3855219E-01	8.7581941E-02	2.3925632E-02	9.3515468E-02	3.9574215E-01	-1.3440306E-03	1.9750682E-01	1.3602803E-02	-1.2012247E-01
	43	5.2345476E-02	1.2867884E 00	8.3558300E-02	8.7200453E-01	-1.6984832E 00	-4.7950307E-03	-1.0354233E 00	-2.6844614E-01	1.0274238E 00
	44	-3.9493095E-01	-5.3511403E-01	3.1729901E-01	-1.5375520E 00	1.1448660E-01	1.8082332E-02	2.6874520E-01	-6.8767345E-02	-6.2731264E-01
	45	8.5048758E-01	-7.8628303E-01	-6.1627302E-01	-2.3475910E-01	-1.4512485E 00	1.3756820E-01	-2.0656136E-01	1.4168892E 00	6.0531555E-01
	46	7.3757861E-01	5.6147993E-01	-5.1686224E-02	3.3725855E-01	-1.2150187E 00	-1.7007091E-02	-9.8569826E-01	-6.6123980E-02	1.3342849E-02
	47	-2.3893225E-02	-1.9600484E 00	-1.7180901E-01	-2.3003080E 00	6.9158671E 00	1.0362093E-02	3.9403695E 00	2.7649836E-01	-3.9840895E 00
	48	4.8819977E-01	5.6977751E-03	-3.2986964E-01	5.9436299E 00	2.8072533E-01	-9.8947883E-03	-6.8214192E-01	3.1891416E-02	2.6840408E 00
	49	-9.6215845E-01	-2.3357798E-01	7.3464632E-01	-4.3324971E-01	1.9638613E 00	-1.7833000E-01	4.8283402E-01	-1.4253868E 00	-8.6143537E-01
	50	-9.3515445E-01	-5.8452344E-01		-9.5183499E-01	9.9265900E-01		1.2784096E 00		4.1529500E-01
	51				1.3709651E 00	-6.5606570E 00		-3.5024131E 00		3.4130728E 00
	52				-5.0418515E 00	-5.9753720E-01				-2.6278575E 00

GEOGRAPHICAL VARIATION

Harmonic		5		6		7		8	
	S / K	9	10	11	12	13	14	15	16
I	0	1.1380116E-01	1.4803078E-01	-1.0642177E-01	1.7618076E-02	-2.6805501E-02	-7.1921433E-02	7.5632998E-02	-1.1804223E-02
	1	-1.7415352E-01	-1.8369036E-02	-7.2474667E-02	-1.1742947E-01	8.7547677E-02	-3.2364952E-02	7.6329883E-03	9.5120866E-02
	2	-4.0119923E-01	-4.2994996E-01	3.9939962E-01	7.8157263E-02	9.2503394E-02	2.8395756E-01	-3.4060031E-01	6.2092094E-03
	3	1.8950709E-01	2.7977725E-02	8.2799038E-02	1.2336493E-01	-1.0442785E-01	3.1315807E-02	-5.6395935E-03	-1.0942508E-01
	4	3.1304441E-01	2.8888269E-01	-2.9861702E-01	-1.0547052E-01	-6.9995308E-02	-2.1597761E-01	2.8021472E-01	

I - Main latitudinal variation. Mixed latitudinal and longitudinal variation: II - First order in longitude, III - Second order in longitude

Notation: For each entry the number given by the first eight digits and sign is multiplied by the power of ten defined by the last two digits and sign.

PREDICTED COEFFICIENTS D_{SK} DEFINING THE FUNCTION $\Gamma(\lambda,\theta,t)$ FOR MONTHLY MEDIAN f_o F2 (Mc/s)

JUNE 1964

TABLE 2

TIME VARIATION

GEOGRAPHICAL VARIATION

Harmonic		0	1		2		3	
	K \ S	0	1	2	3	4	5	6
I	0	3.0324422E 00	-9.0486850E-02	-2.3291110E-01	-2.2762156E-02	-1.5374736E-01	9.2361225E-03	2.1855628E-02
	1	-6.7212377E-01	-1.5911005E-01	-5.0065280E-01	1.4509572E-01	-4.1195571E-01	8.3821439E-02	3.3895850E-02
	2	1.8340506E 00	5.7746060E-01	2.2109548E 00	3.8503544E-02	7.4426055E-02	-3.1794955E-01	-4.2347143E-01
	3	2.1580049E 00	5.7027076E-01	1.7250208E 00	-8.9841002E-01	1.8523277E 00	-3.0851985E-01	2.1268314E-03
	4	-5.5564513E 00	-1.2122574E 00	-5.2047146E 00	-7.0668948E-01	1.0855105E 00	1.2598376E 00	1.2764472E 00
	5	-3.0063035E 00	-6.7019809E-01	-2.8030939E 00	1.4306389E 00	-2.7168621E 00	4.5676399E-01	-3.7663335E-02
	6	6.1794639E 00	1.2929179E 00	4.8807525E 00	1.5199779E 00	-1.8807403E 00	-1.7752726E 00	-1.4199741E 00
	7	1.4813943E 00	2.7210453E-01	1.4775797E 00	-6.6959773E-01	1.2944458E 00	-2.4193061E-01	1.5259765E-02
	8	-2.3835100E 00	-5.5502589E-01	-1.6987189E 00	-8.4241511E-01	8.8112868E-01	8.2448438E-01	5.5180739E-01
II	9	-1.0910967E-02	1.4519013E-02	1.6402090E-02	-2.3255359E-02	-2.6033922E-03	1.8674057E-03	-5.1855125E-03
	10	1.1010308E-01	5.9426109E-02	1.1075176E-01	-2.9086980E-02	3.7653958E-02	-2.2854780E-02	3.4254113E-02
	11	2.6727853E-01	-2.0069239E-02	1.6053481E-01	-7.9779339E-02	-1.1821150E-02	-1.5667192E-03	-3.9403151E-02
	12	-4.8455455E-01	-2.8376147E-01	-9.1030869E-01	3.9721499E-02	-1.4082713E-01	1.0477457E-01	1.2325957E-01
	13	2.1563494E-01	-2.3430735E-01	-4.2090302E-01	7.9492208E-02	-2.0858439E-01	-4.7289944E-02	-1.2522741E-01
	14	-1.0825306E 00	-1.0690765E 00	-1.1182976E 00	4.5696933E-01	-7.5488199E-01	3.1707702E-01	-7.2386801E-01
	15	-1.8886028E 00	9.7373097E-02	-6.2253435E-01	4.7129412E-01	1.1240440E-01	1.0877007E-01	2.3390006E-01
	16	3.5024979E 00	1.6886044E 00	5.5571094E 00	-4.4041201E-01	3.8430190E-01	-9.0368510E-01	-4.8881086E-01
	17	-4.0277988E-01	1.2592516E 00	1.8162505E 00	-3.3111179E-01	1.3065452E 00	5.6503330E-01	8.9989944E-01
	18	2.5637256E 00	4.7158695E 00	4.2088999E 00	-1.6965730E 00	3.5533594E 00	-1.1553035E 00	3.0094152E 00
	19	3.9523243E 00	-3.8308341E-01	8.2941301E-01	-8.4205005E-01	-3.9423068E-02	-9.4744431E-02	-4.2075972E-01
	20	-6.6864511E 00	-3.0579557E 00	-9.2516853E 00	1.1539169E 00	-7.2012183E-02	1.9327941E 00	4.8839397E-01
	21	6.9763546E-01	-2.3666823E 00	-2.6802729E 00	6.0669143E-01	-2.4320096E 00	-1.2239578E 00	-1.5794339E 00
	22	-1.9692365E 00	-7.6668910E 00	-6.7282728E 00	2.3108470E 00	-5.6753032E 00	1.5731030E 00	-4.5947403E 00
	23	-2.5894080E 00	2.7141058E-01	-3.6939745E-01	4.4618607E-01	-7.5390812E-02	-2.7302175E-02	2.8612961E-01
	24	3.8739051E 00	1.7662759E 00	4.9590358E 00	-8.4528755E-01	-2.4702424E-01	-1.2164350E 00	-1.0637864E-01
	25	-1.8227700E-01	1.4944385E 00	1.6342462E 00	-3.2080738E-01	1.3490051E 00	6.9339618E-01	7.8761493E-01
	26	1.2063075E-01	4.0887735E 00	3.6007631E 00	-1.0593115E 00	2.9136653E 00	-7.3852113E-01	2.3421237E 00
III	27	-5.1335645E-04	-2.2797058E-02	2.6595501E-02	-9.7765439E-04	-6.8573904E-03	-1.0900172E-03	1.2298878E-03
	28	-5.8040552E-04	-6.0704988E-03	1.6821274E-04	-2.4665258E-03	6.7720056E-03	-2.2583271E-04	6.7155840E-03
	29	-3.5418641E-03	-1.1765585E-01	1.0022250E-04	-1.5032669E-02	-7.1004456E-02	3.5893050E-02	-1.4299197E-03
	30		-4.4814727E-02	-3.7225348E-03	2.2882946E-02	-6.1063796E-02	1.6885812E-02	9.1807455E-03
	31		3.8218749E-02	-2.9251232E-03	-7.4716274E-02	3.7286953E-03	-1.0202601E-03	-5.1870610E-02
	32		1.2235851E-01	9.1461066E-03	-3.7836397E-03	4.4683171E-03	-1.0006212E-02	-4.5647198E-02
	33		2.5346386E-01	2.8859184E-03	-8.8934958E-03	1.2381075E-01	-9.1688524E-02	6.5216352E-03
	34		1.6311319E-01	1.3513938E-02		2.0628878E-01		
	35		-1.0453497E-02	1.0223640E-02		-9.5833192E-03		
	36		-3.1568240E-02	-3.6879862E-02		-1.3788732E-02		

GEOGRAPHICAL VARIATION

Harmonic		4		5		6	
	K \ S	7	8	9	10	11	12
I	0	1.8653107E-02	4.4869805E-03	1.0545728E-02	1.0012873E-02	-4.4784406E-03	5.5664350E-03
	1	4.1687226E-02	3.2937289E-02	-4.6176404E-02	-1.0510667E-02	-4.0853804E-03	-2.6177093E-02
	2	-2.8680637E-02	-1.5701257E-02	-6.7095936E-03	-1.5849750E-02	9.7226248E-03	-2.8271525E-03
	3	-5.0072127E-02	-3.0009052E-02	5.0093032E-02	1.3375946E-02	1.5795102E-03	2.8117253E-02

I - Main latitudinal variation. Mixed latitudinal and longitudinal variation: II - First order in longitude, III - Second order in longitude.

Notation: For each entry the number given by the first eight digits and sign is multiplied by the power of ten defined by the last two digits and sign.

PREDICTED COEFFICIENTS D_{SK} DEFINING THE FUNCTION $\Gamma(\lambda,\theta,t)$ FOR MONTHLY MEDIAN M(3000)F2

JUNE 1964

JUNE 1964 UT=00

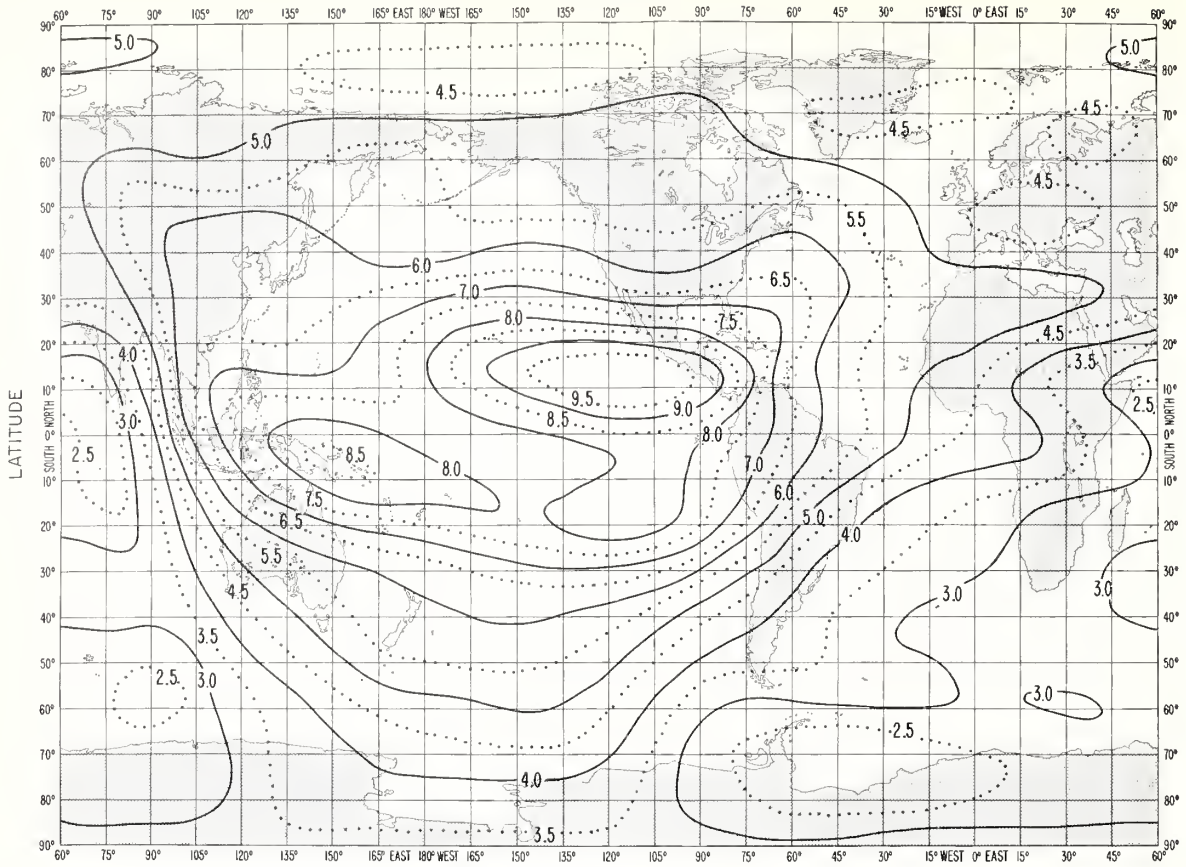

FIG. 1 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

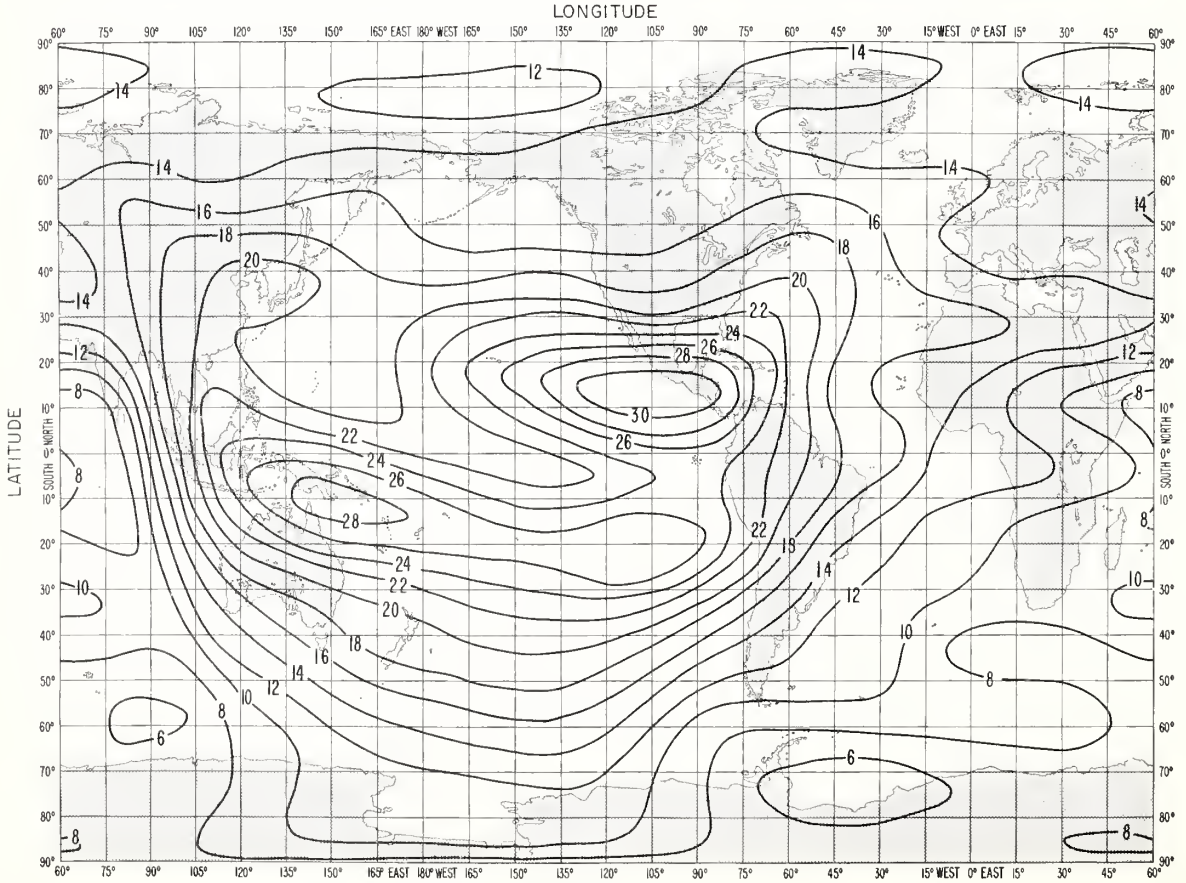

FIG. 1 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

JUNE 1964 UT=02

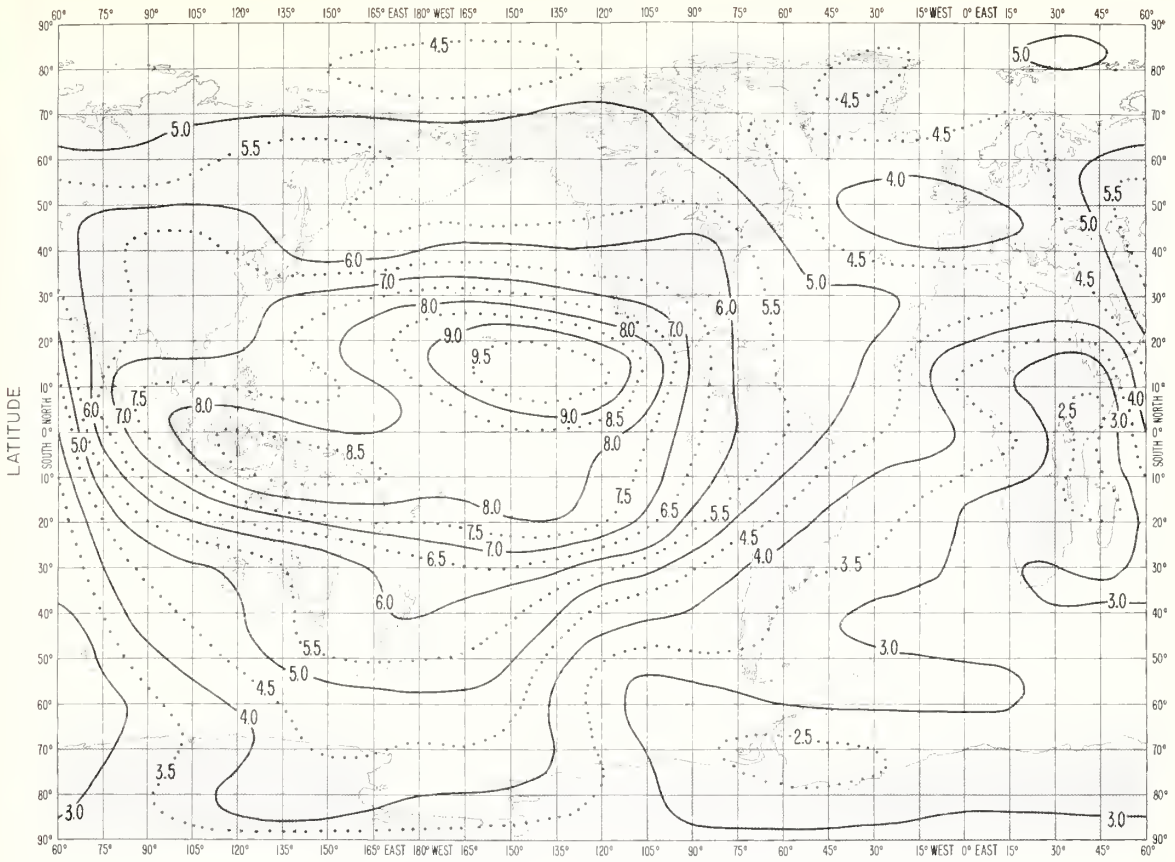

FIG. 2A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

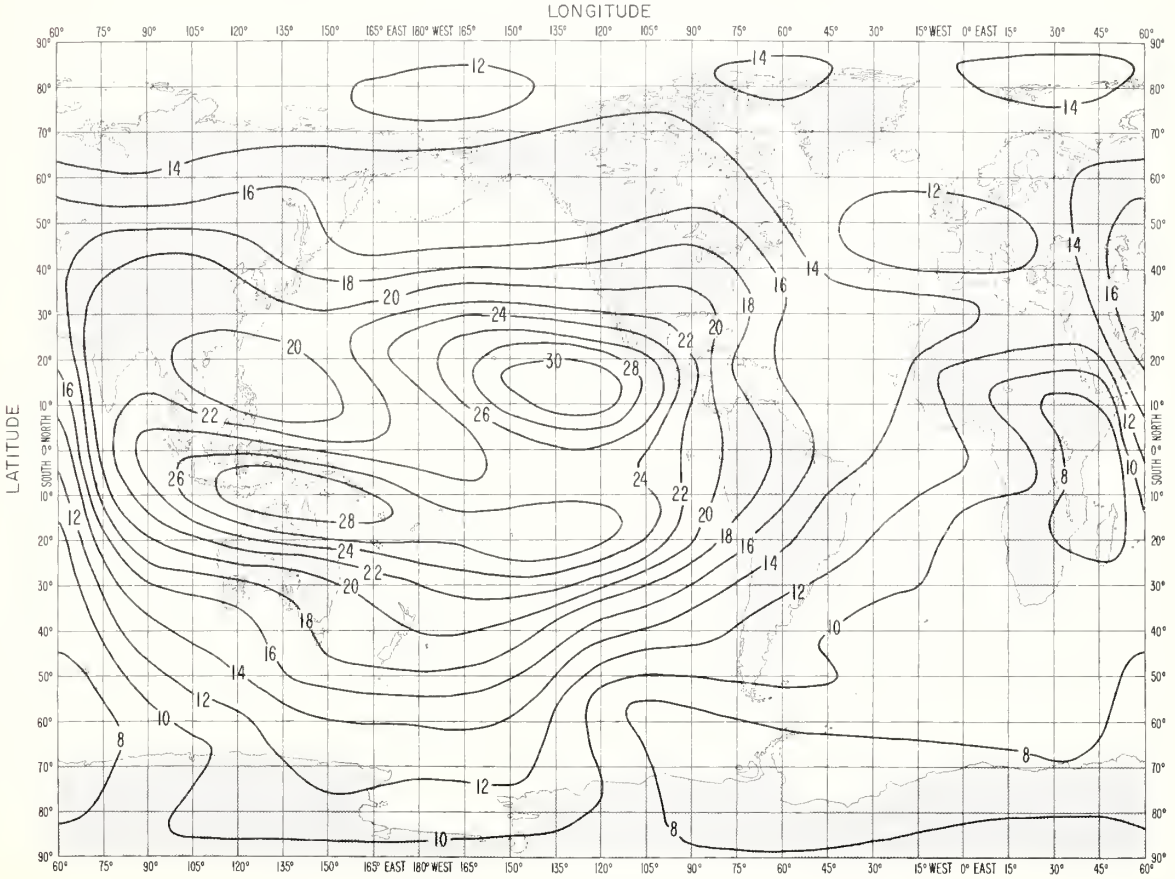

FIG. 2B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

JUNE 1964 UT=04

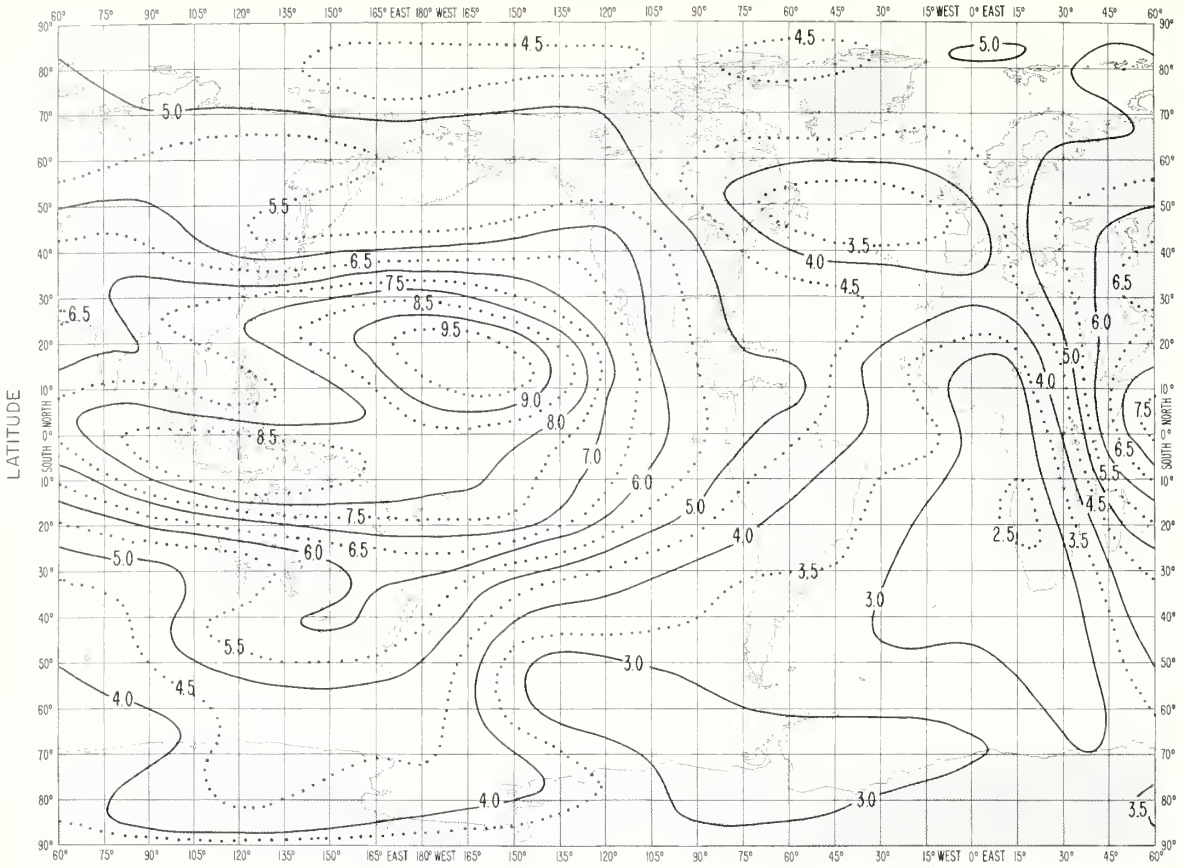

FIG. 3A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

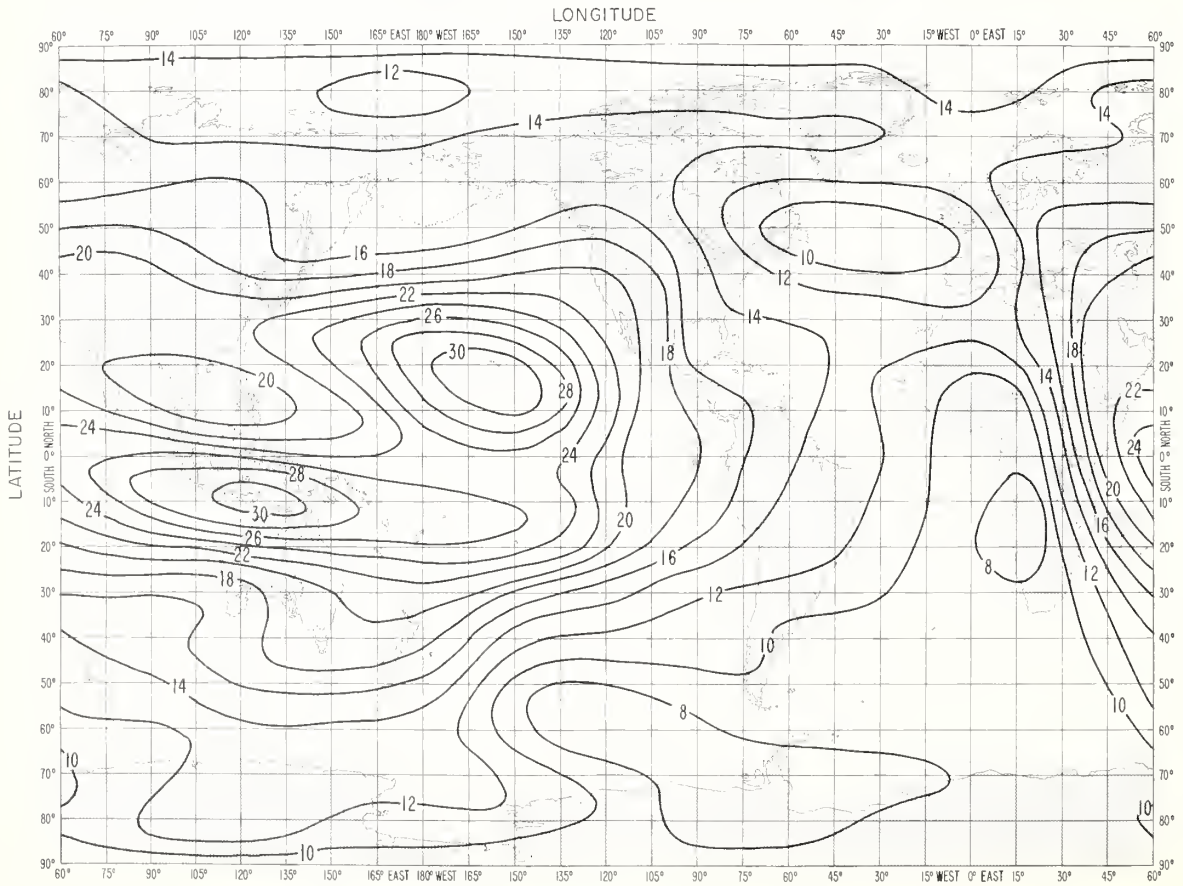

FIG. 3B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

JUNE 1964 UT=06

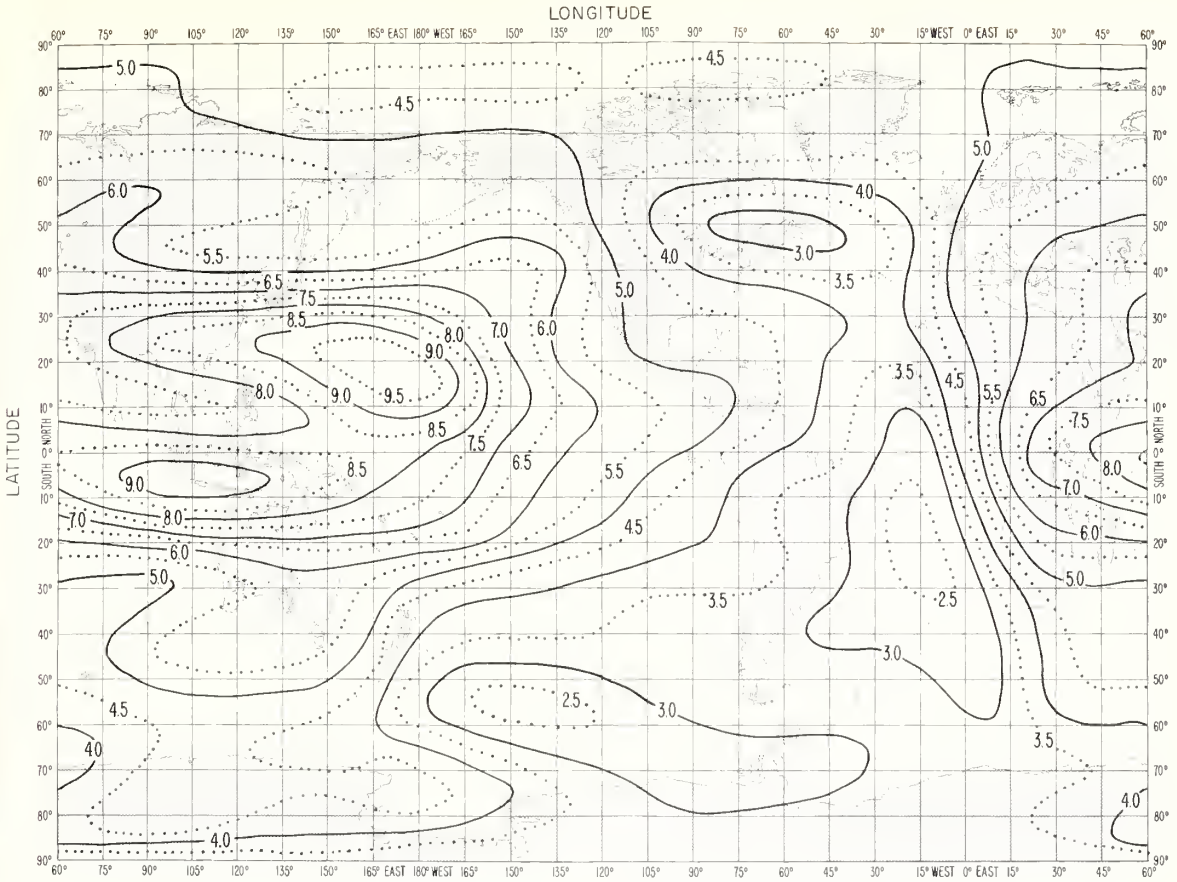

FIG. 4A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

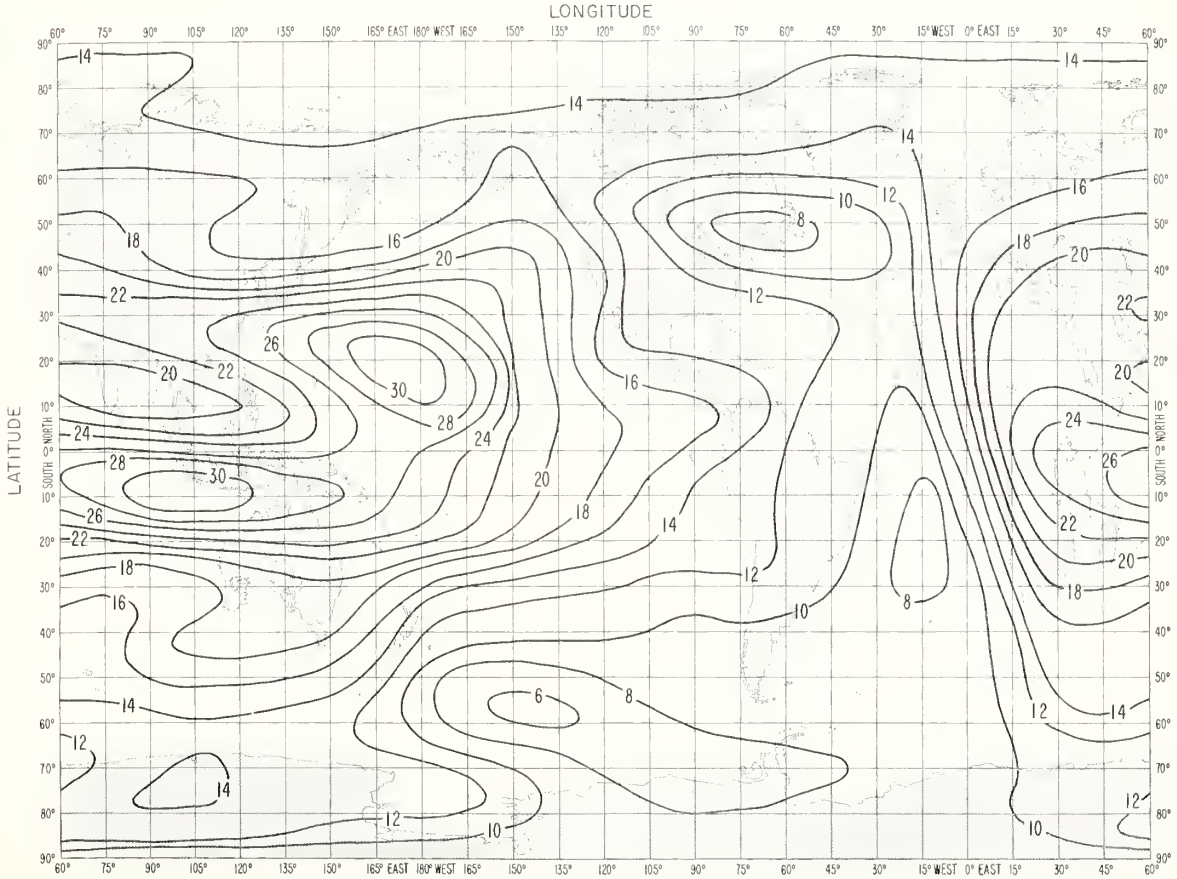

FIG. 4B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

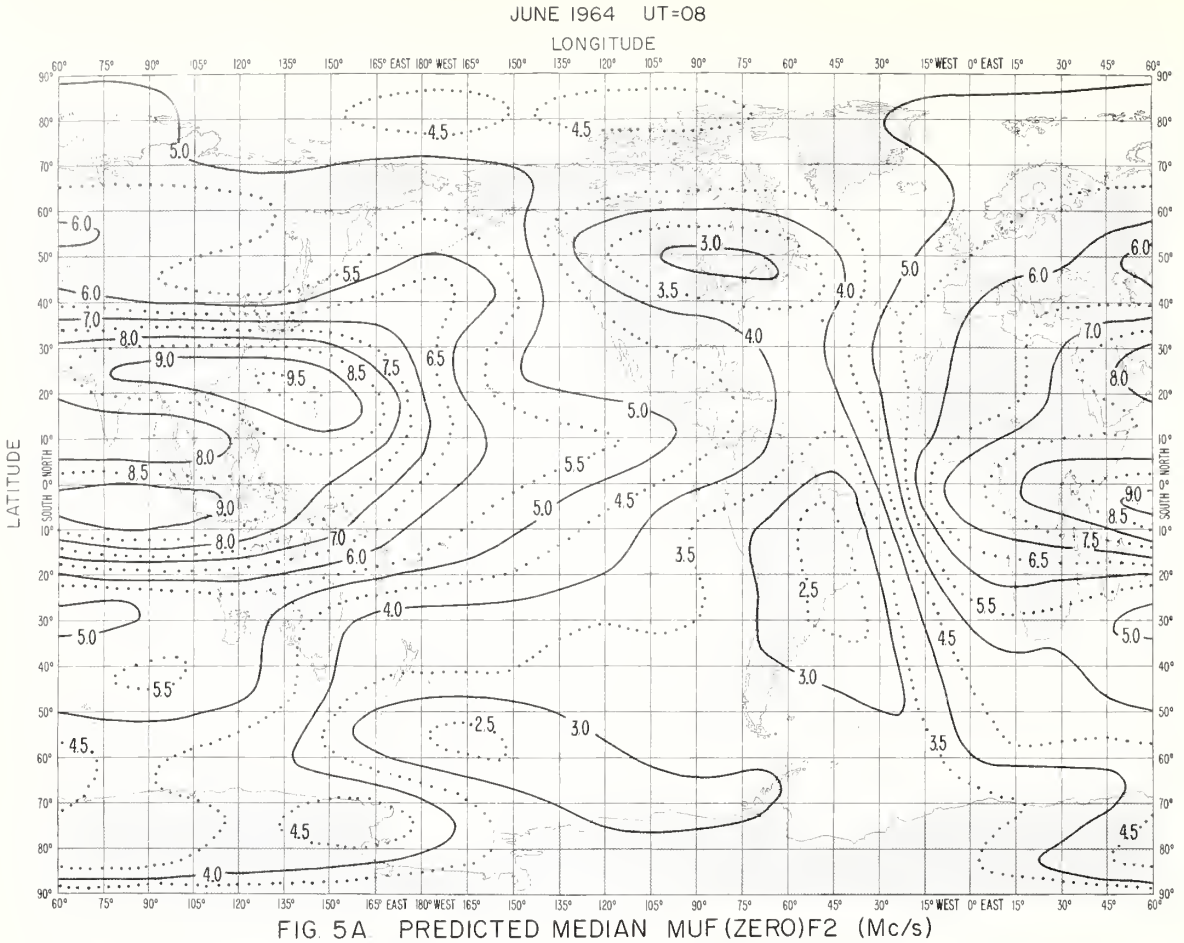

FIG. 5A PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

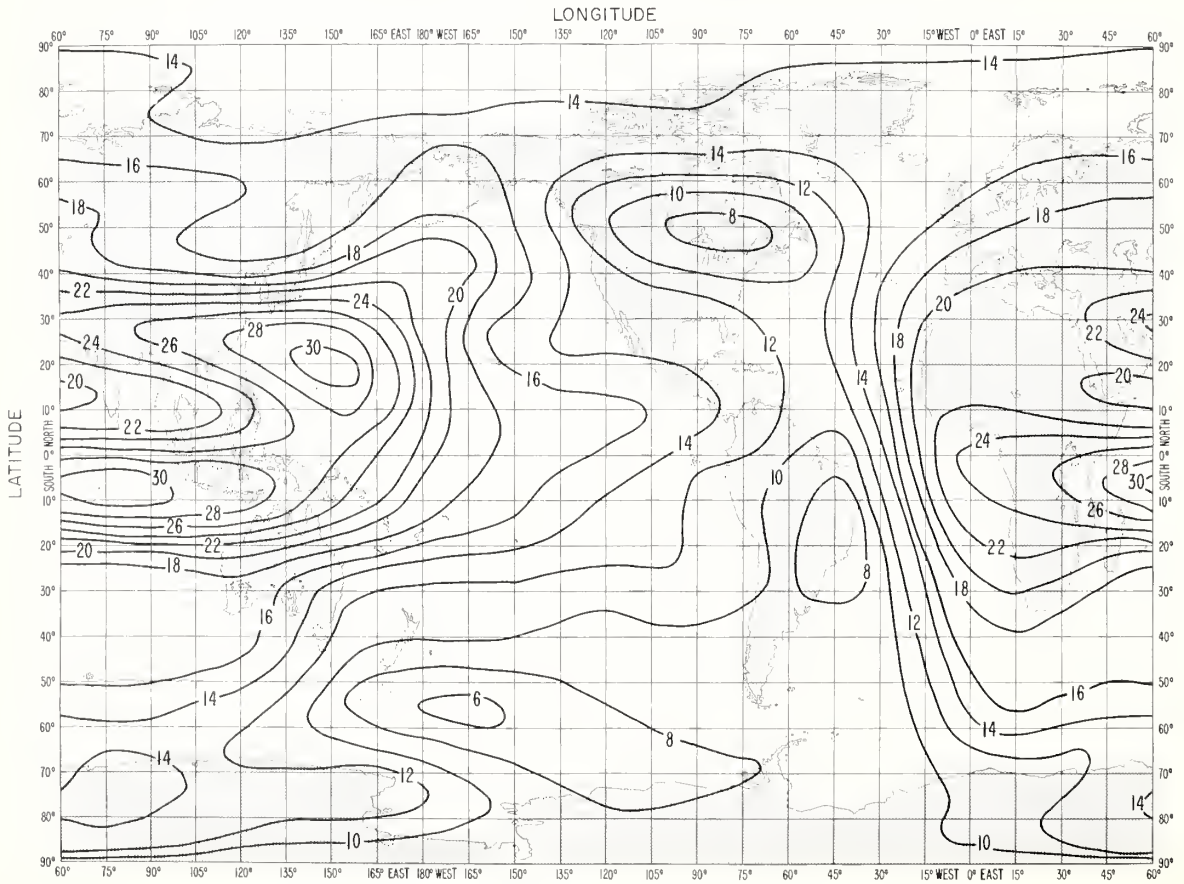

FIG. 5B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

JUNE 1964 UT=10

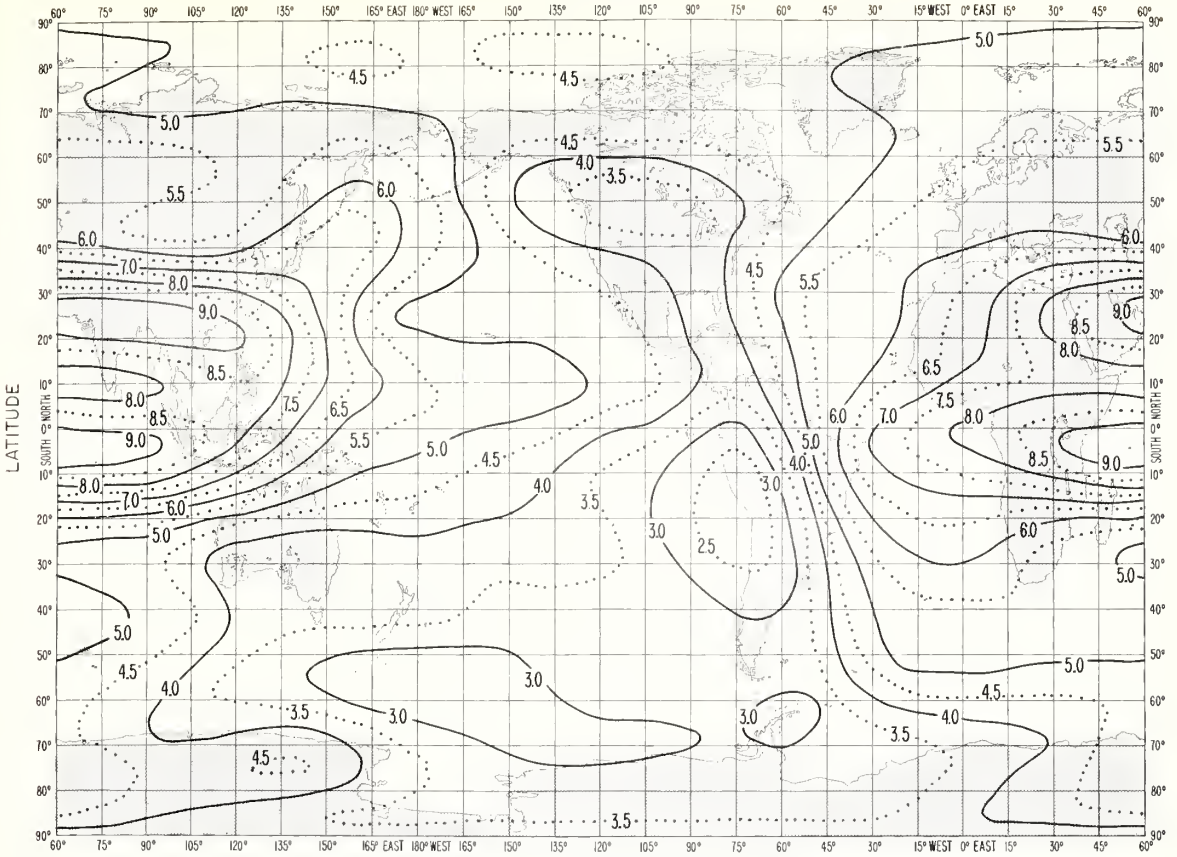

FIG. 6A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

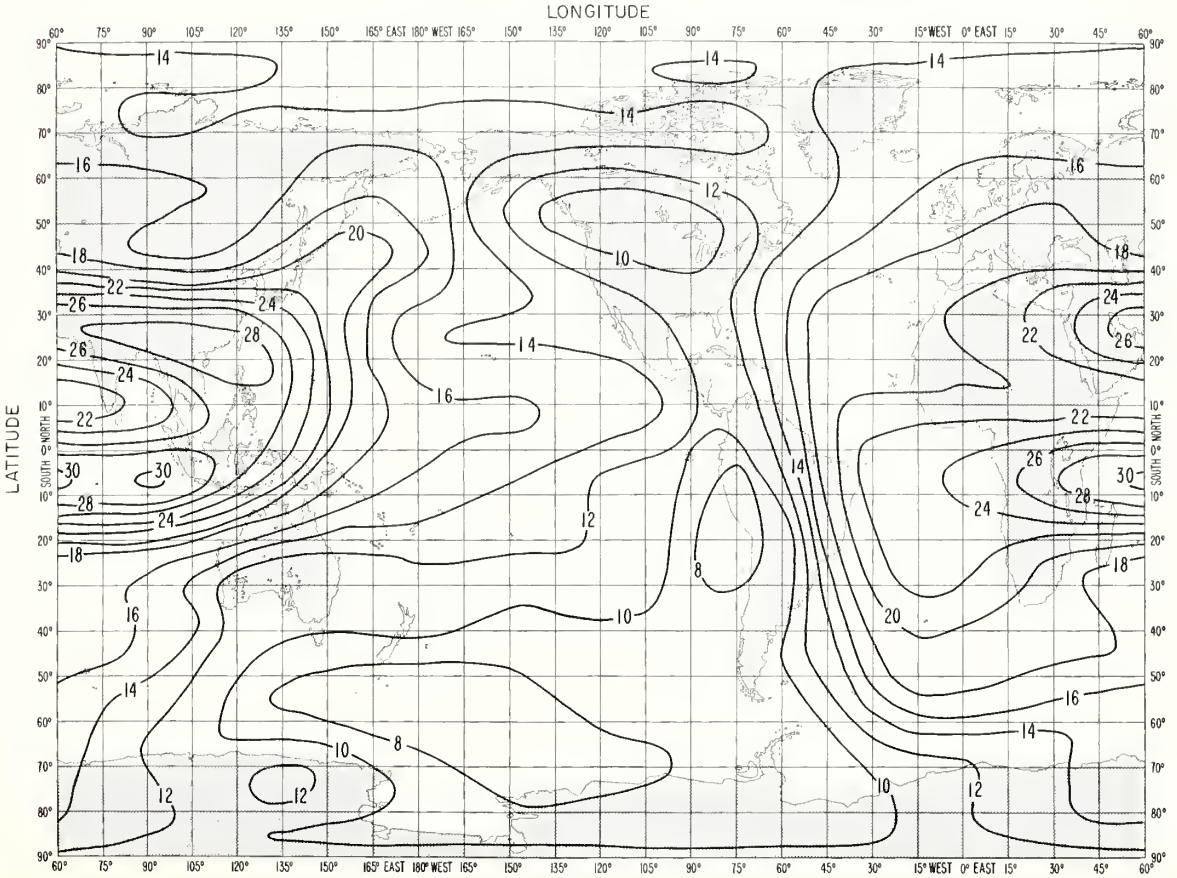

FIG. 6B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

JUNE 1964 UT= 12

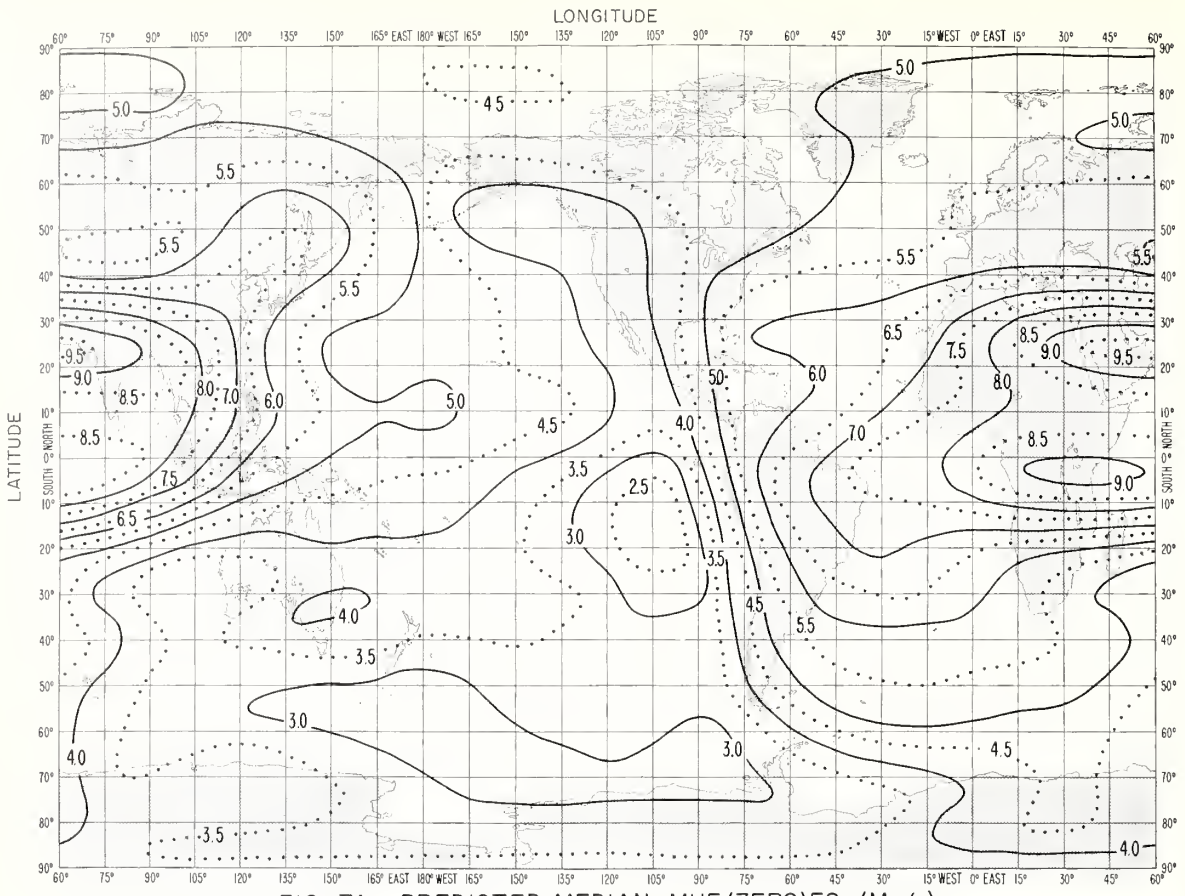

FIG. 7A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

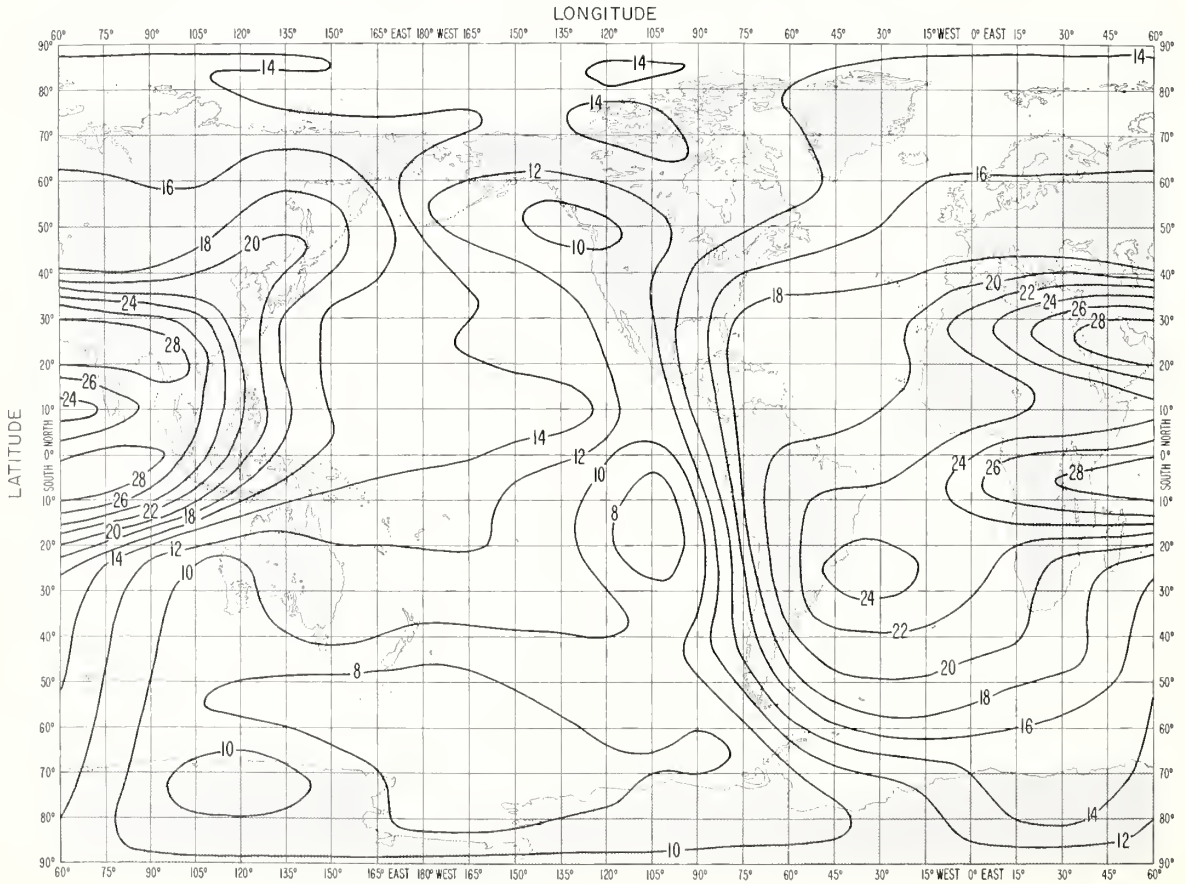

FIG. 7B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

JUNE 1964 UT=14

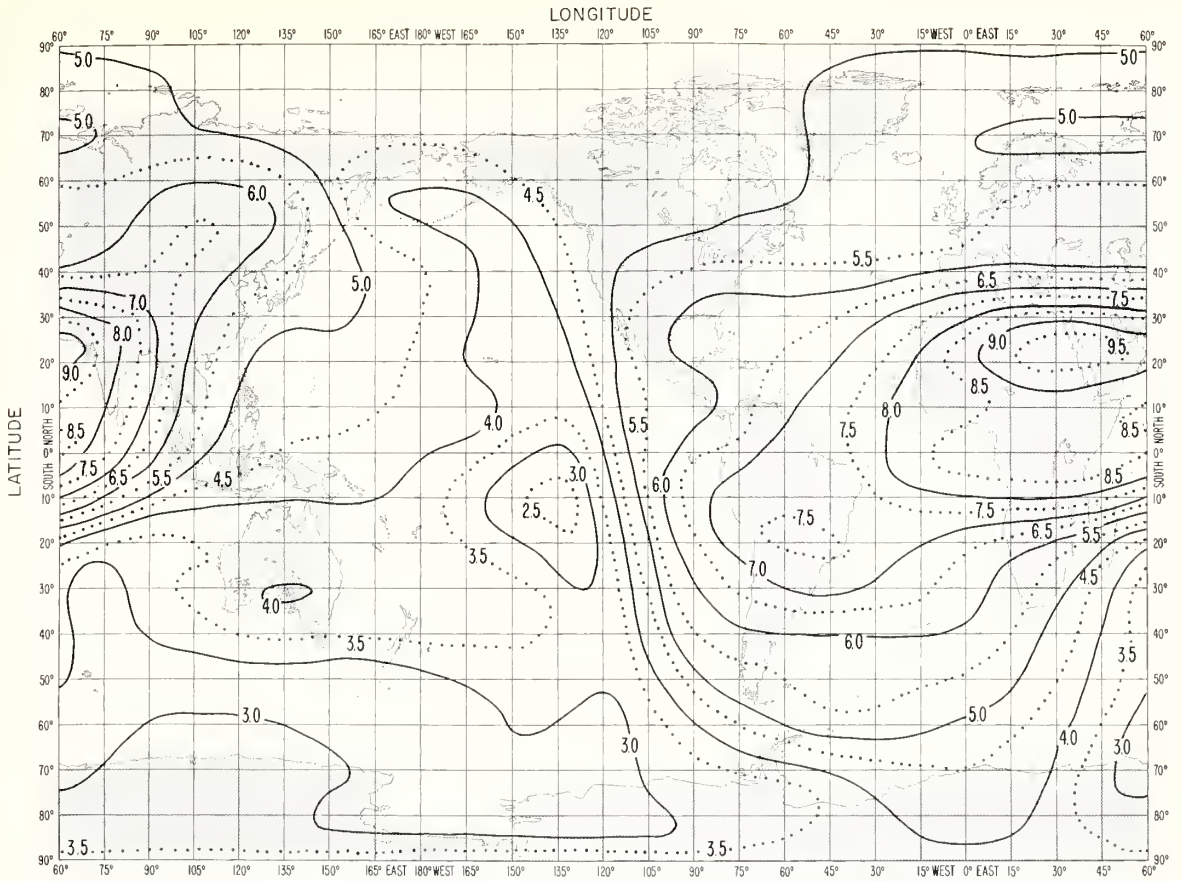

FIG. 8A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

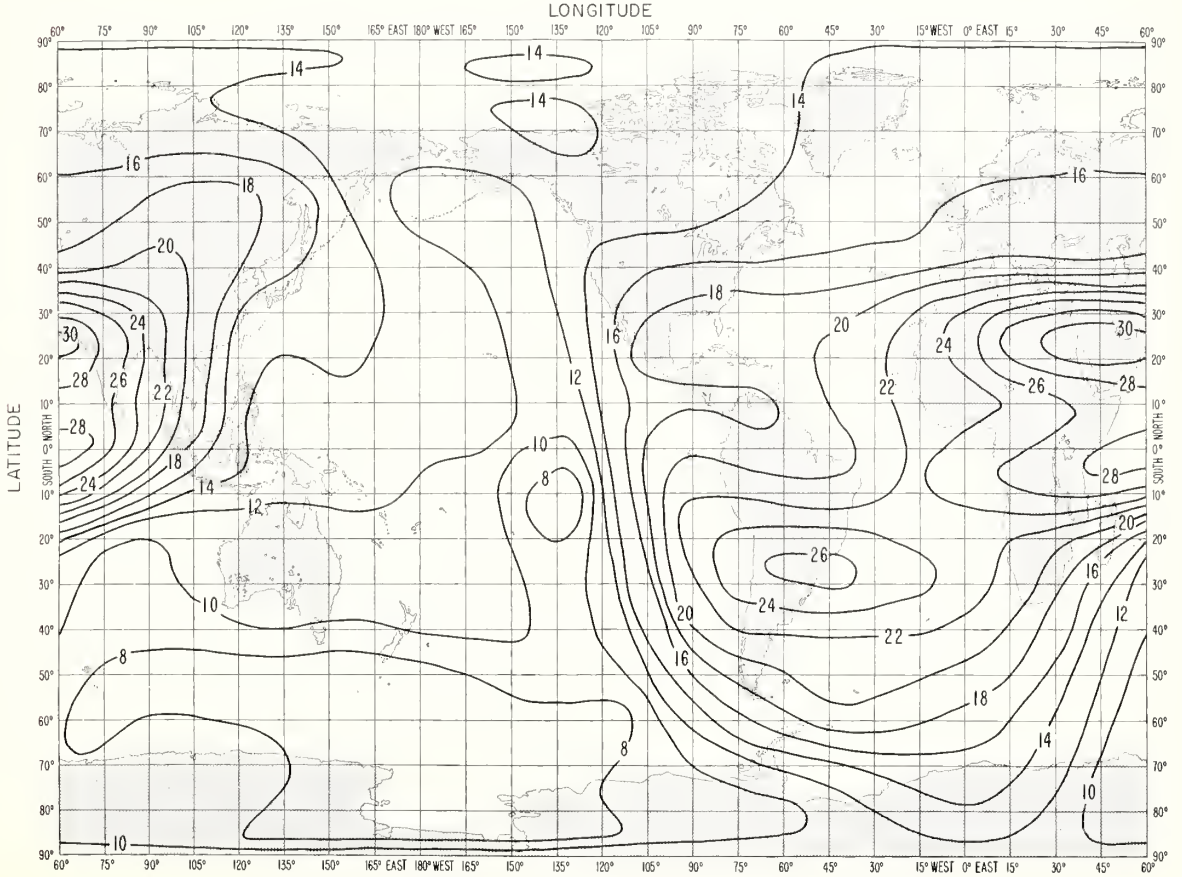

FIG. 8B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

JUNE 1964 UT= 12

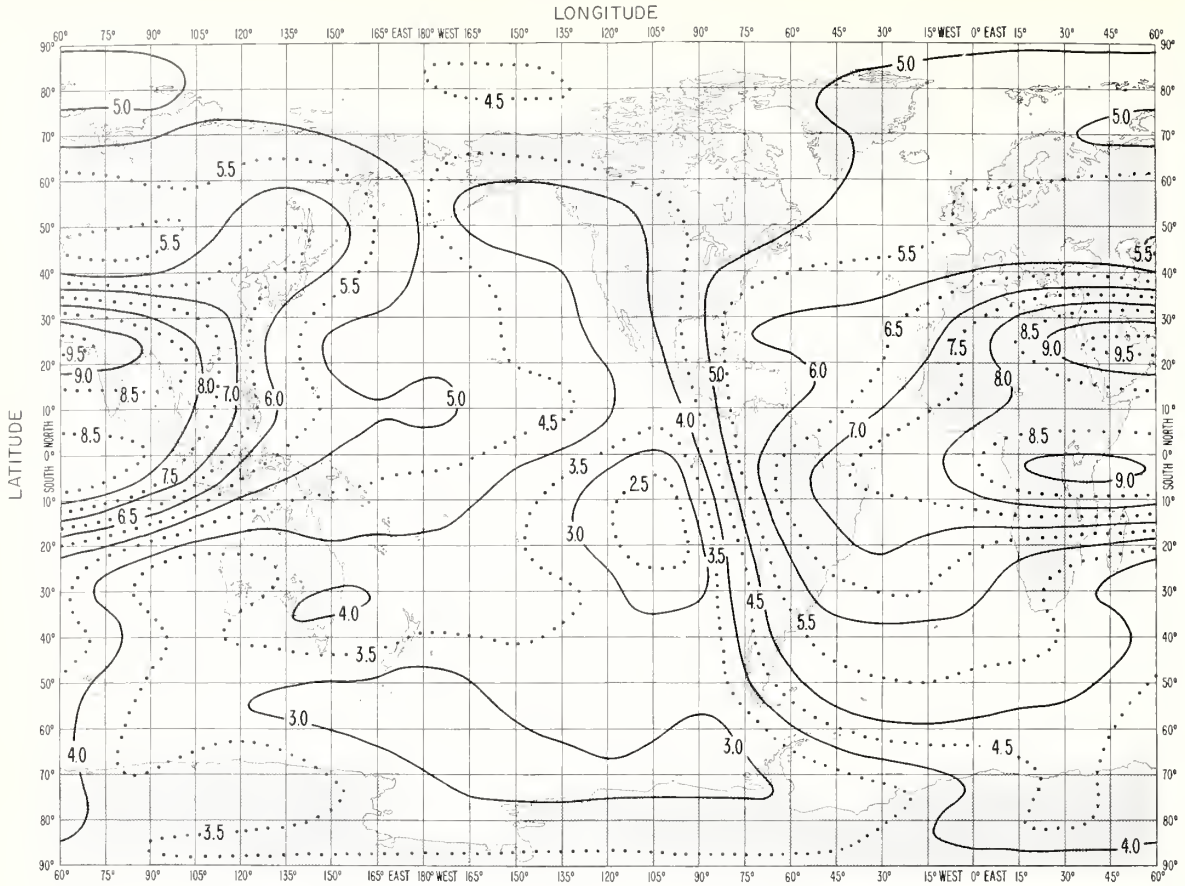

FIG. 7A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

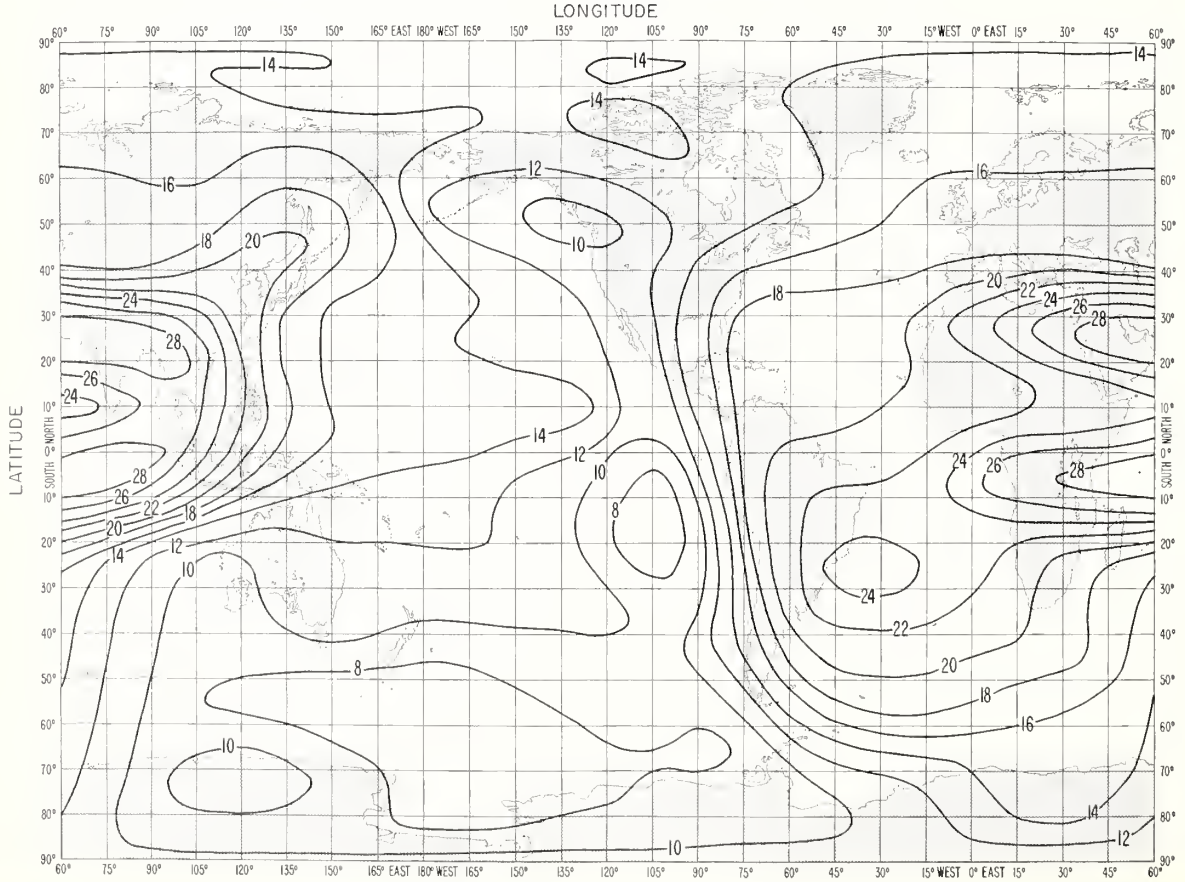

FIG. 7B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

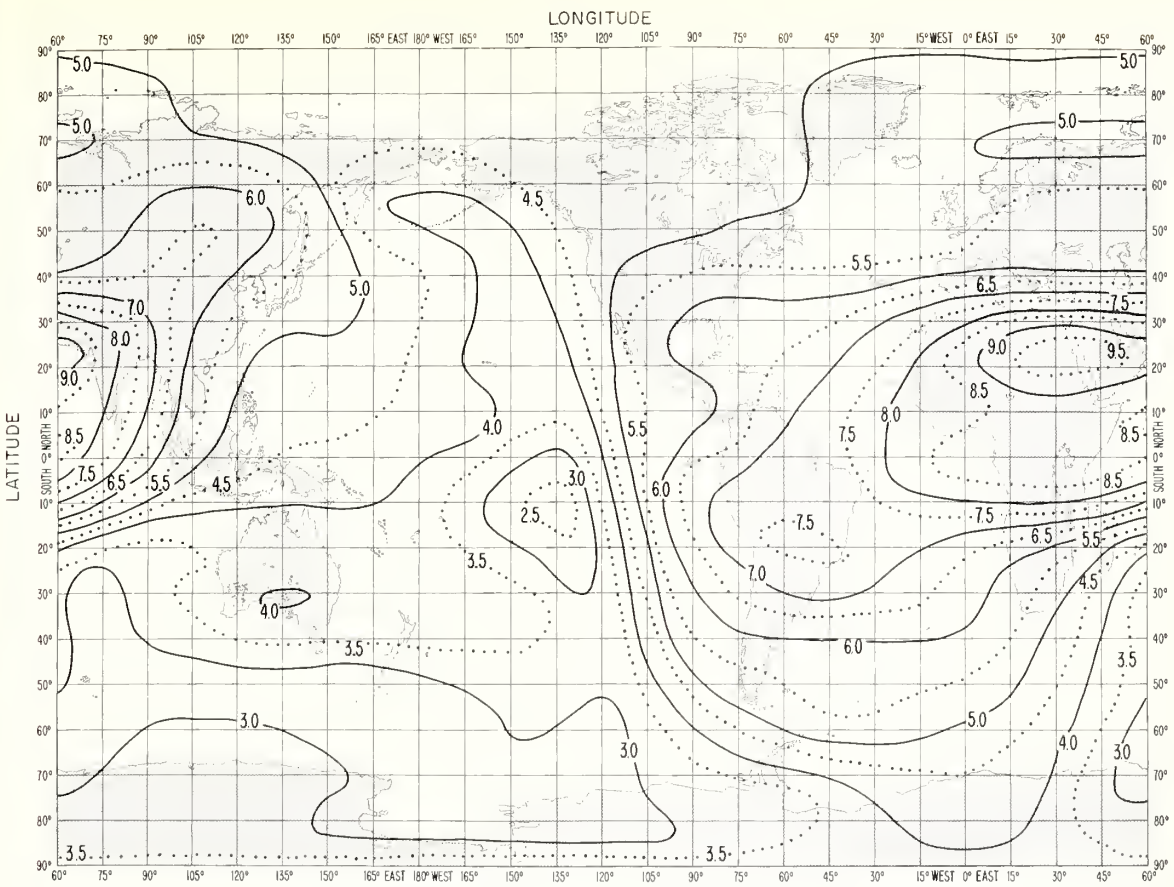

FIG. 8A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

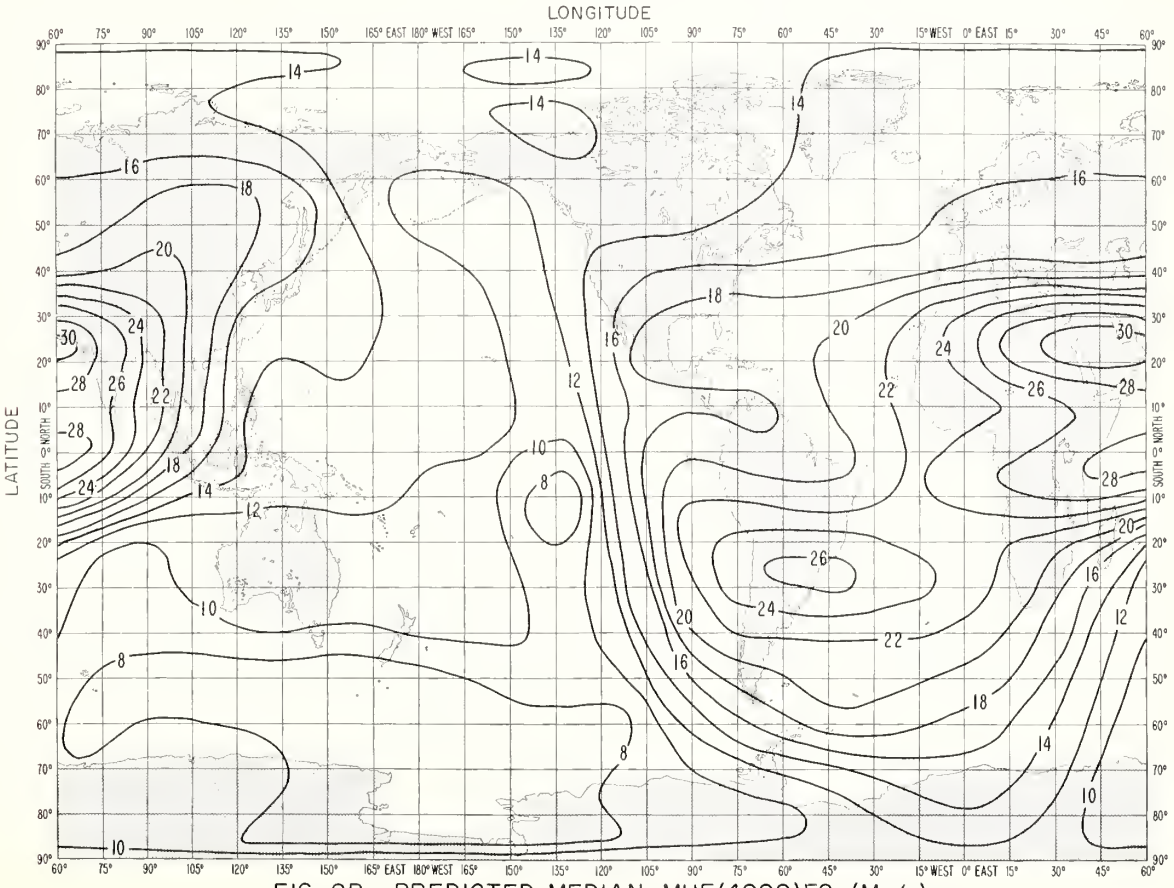

FIG. 8B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

JUNE 1964 UT=16

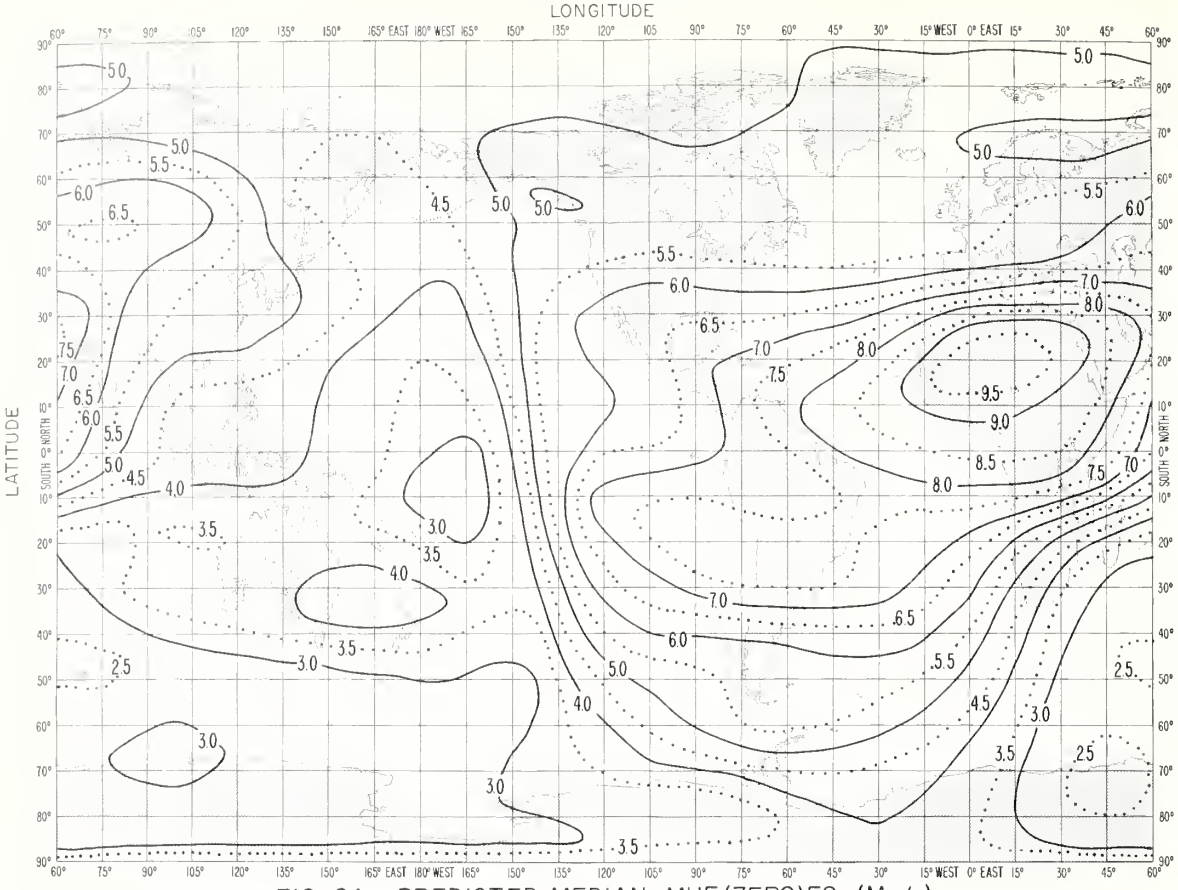

FIG. 9A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

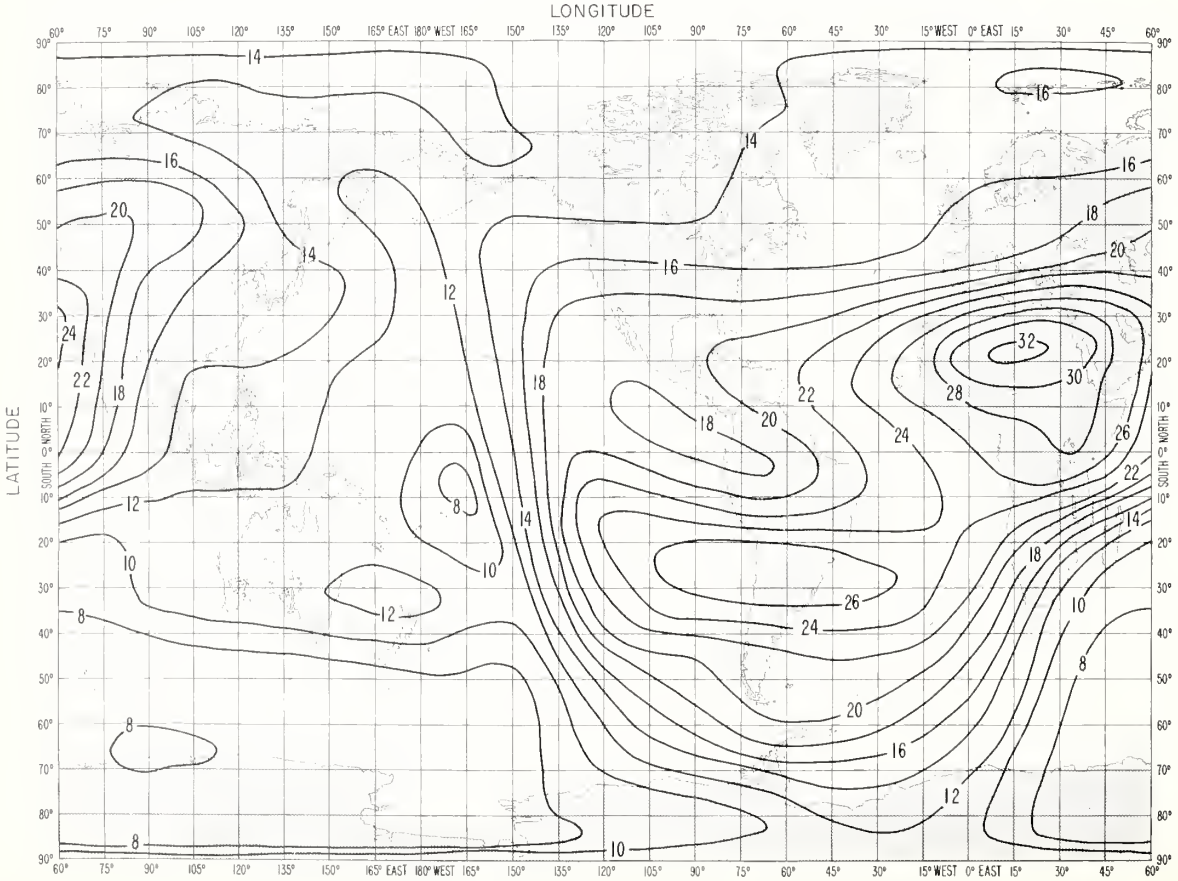

FIG. 9B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

JUNE 1964 UT= 18

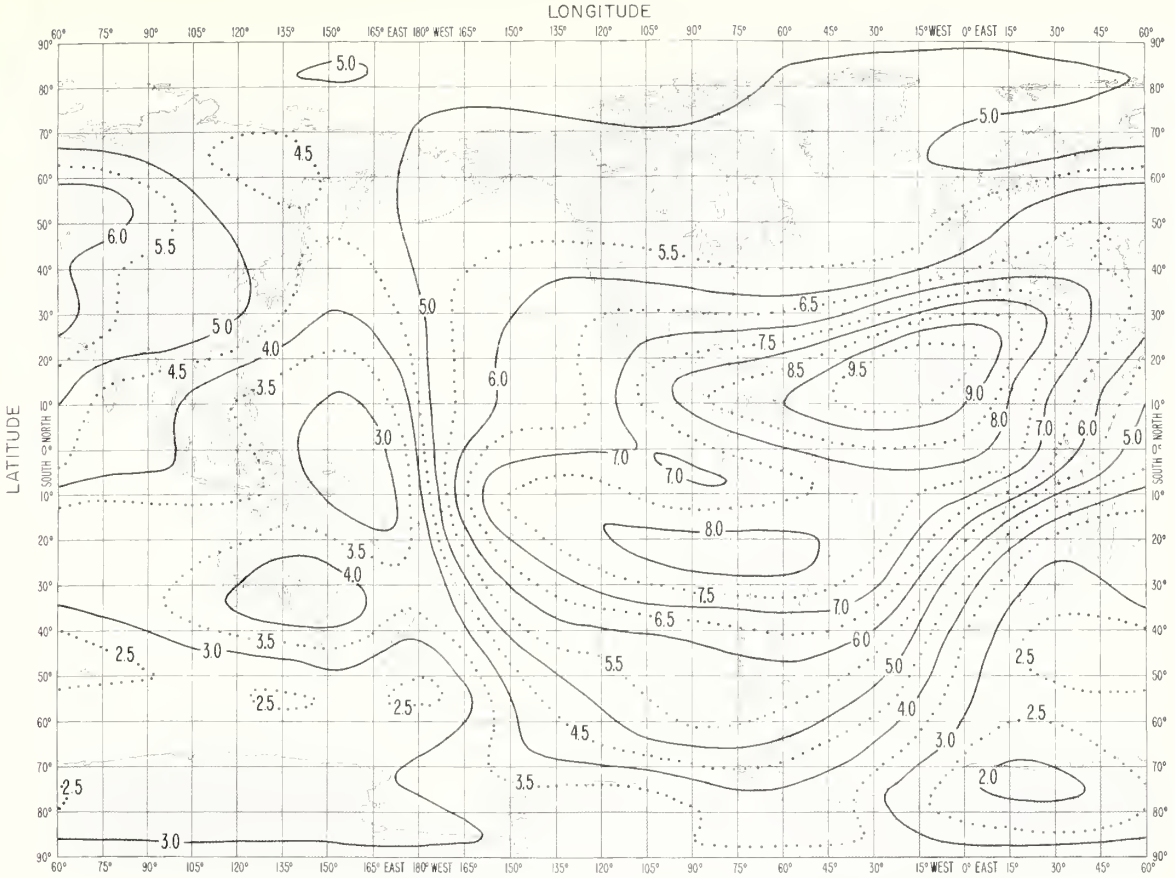

FIG. 10A. PREDICTED MEDIAN MUF (ZERO) F2 (Mc/s)

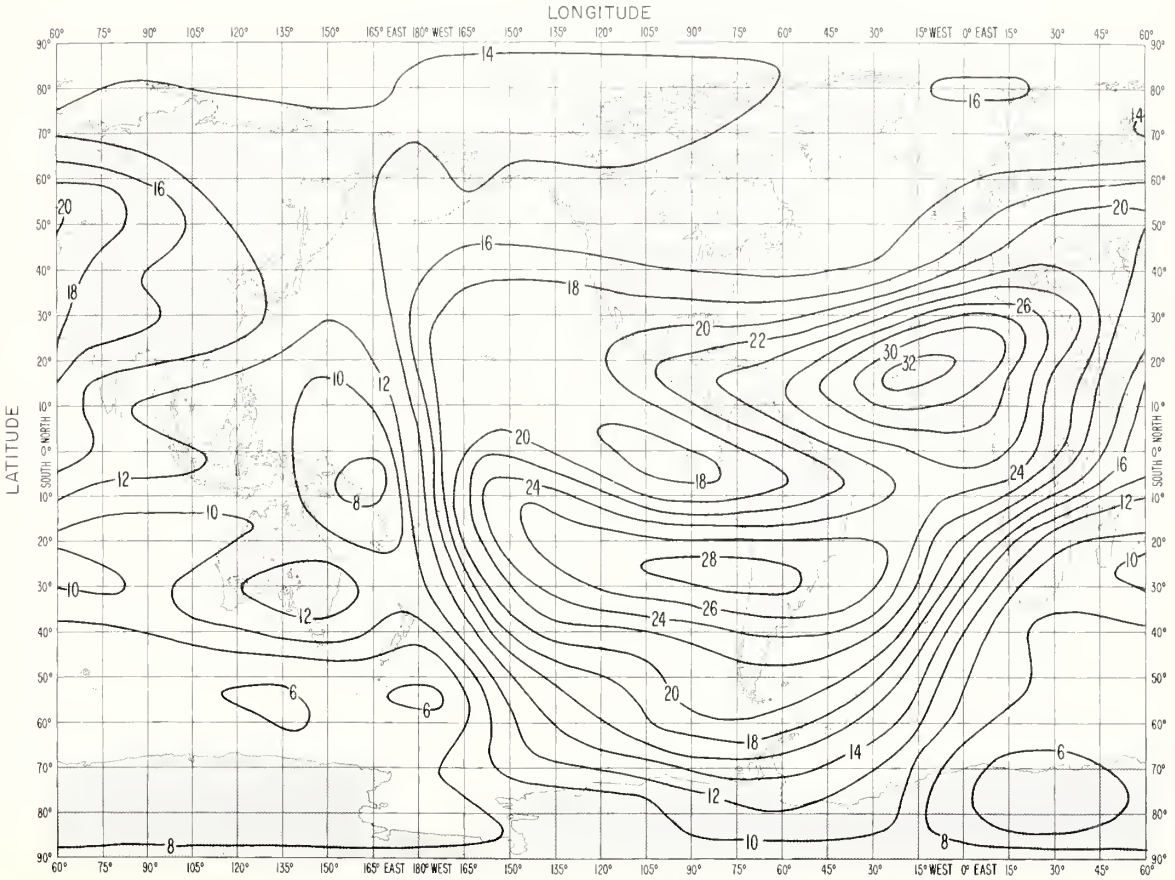

FIG. 10B. PREDICTED MEDIAN MUF (4000) F2 (Mc/s)

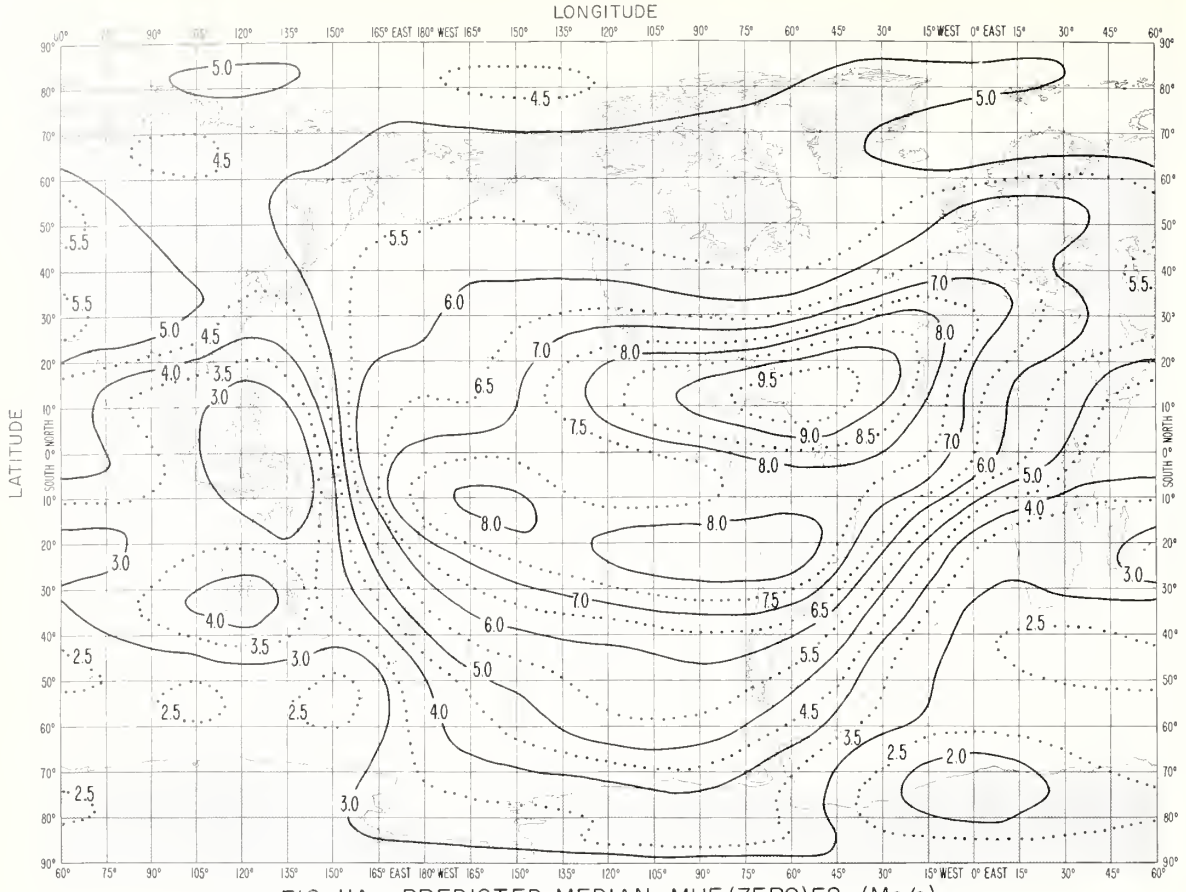

FIG IIA. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

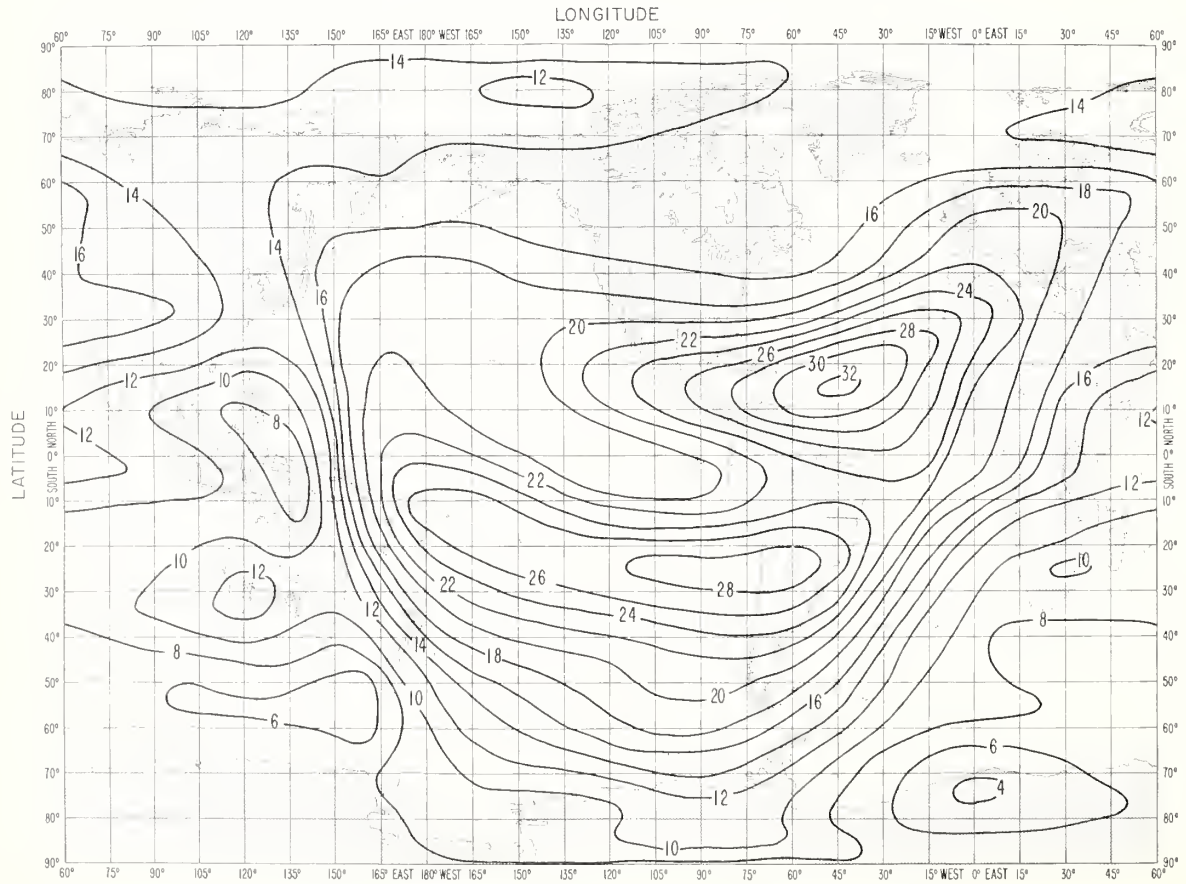

FIG.II B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

JUNE 1964 UT=22

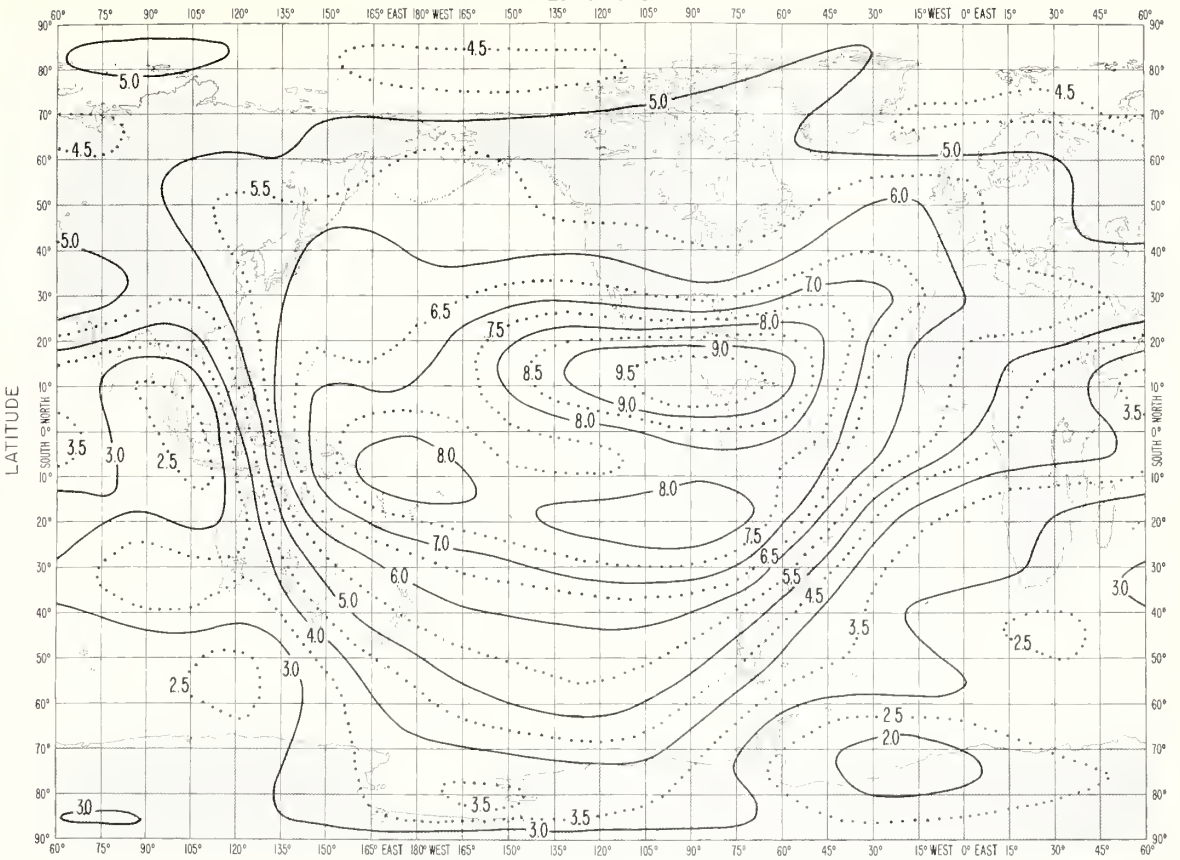

FIG. 12A. PREDICTED MEDIAN MUF (ZERO) F2 (Mc/s)

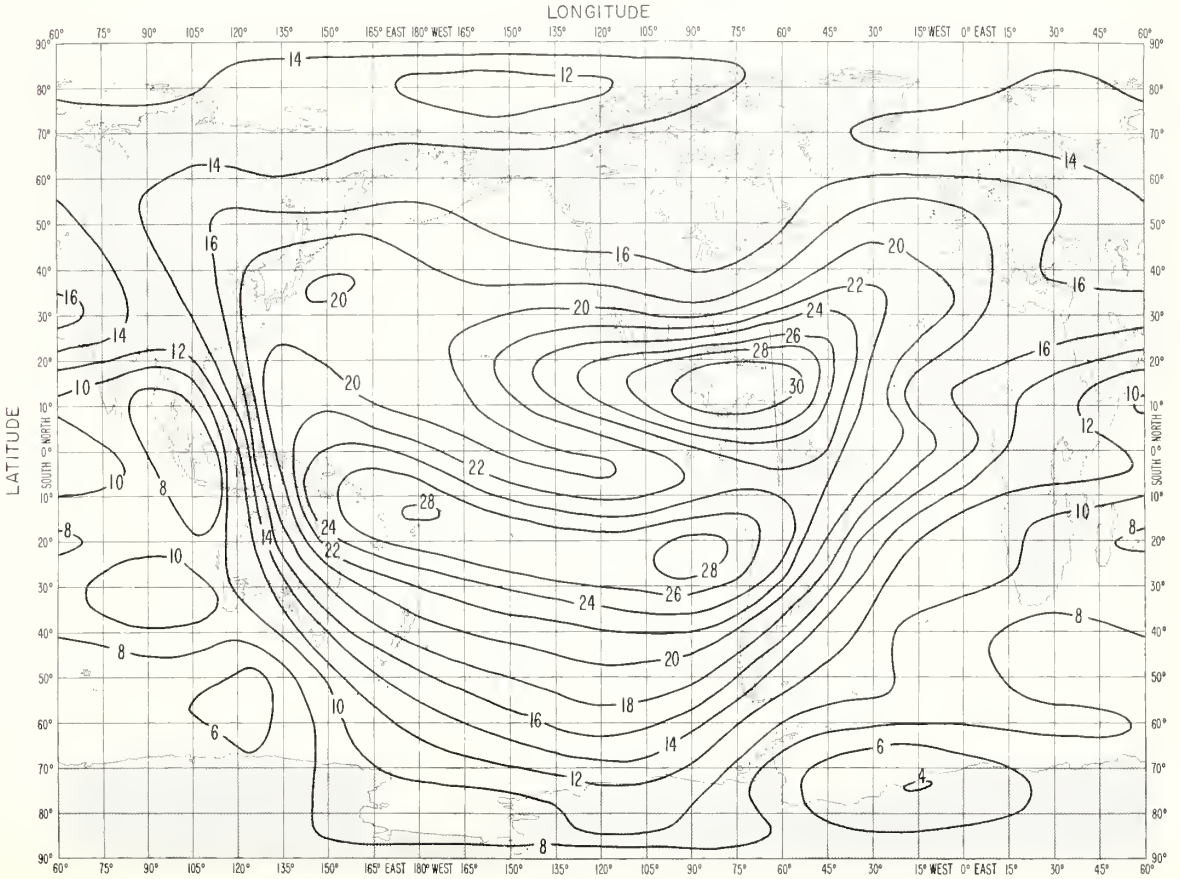

FIG. 12B. PREDICTED MEDIAN MUF (4000) F2 (Mc/s)

NORTH POLAR AREA
JUNE 1964 UT=00

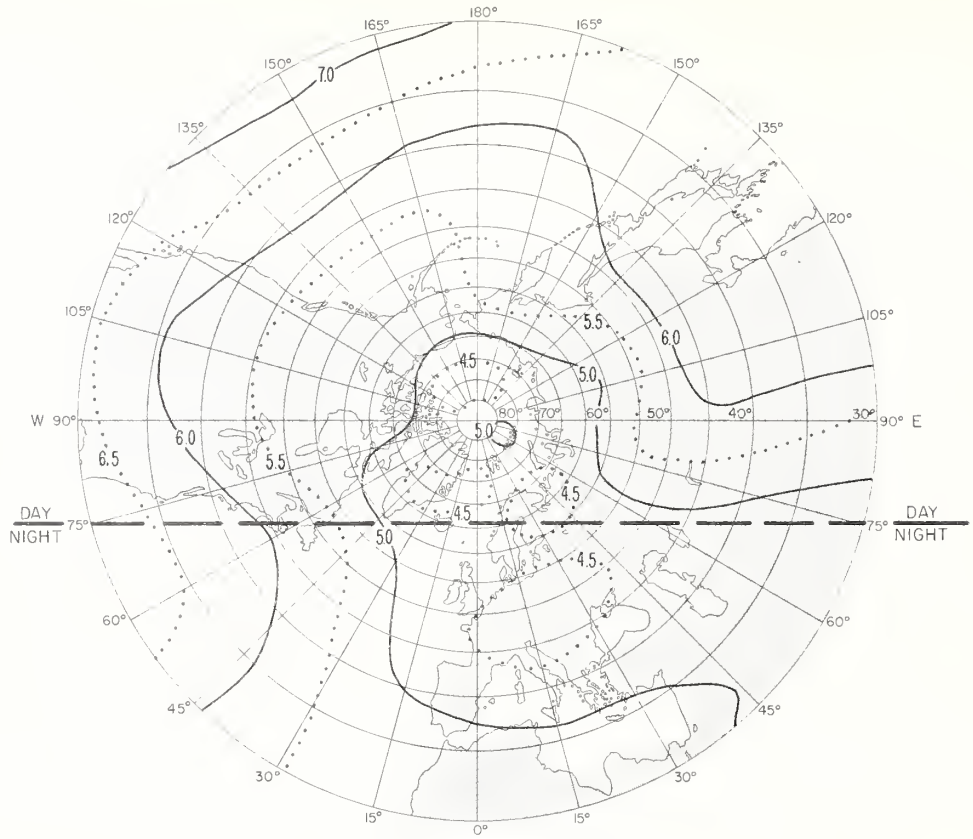

FIG. 13A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

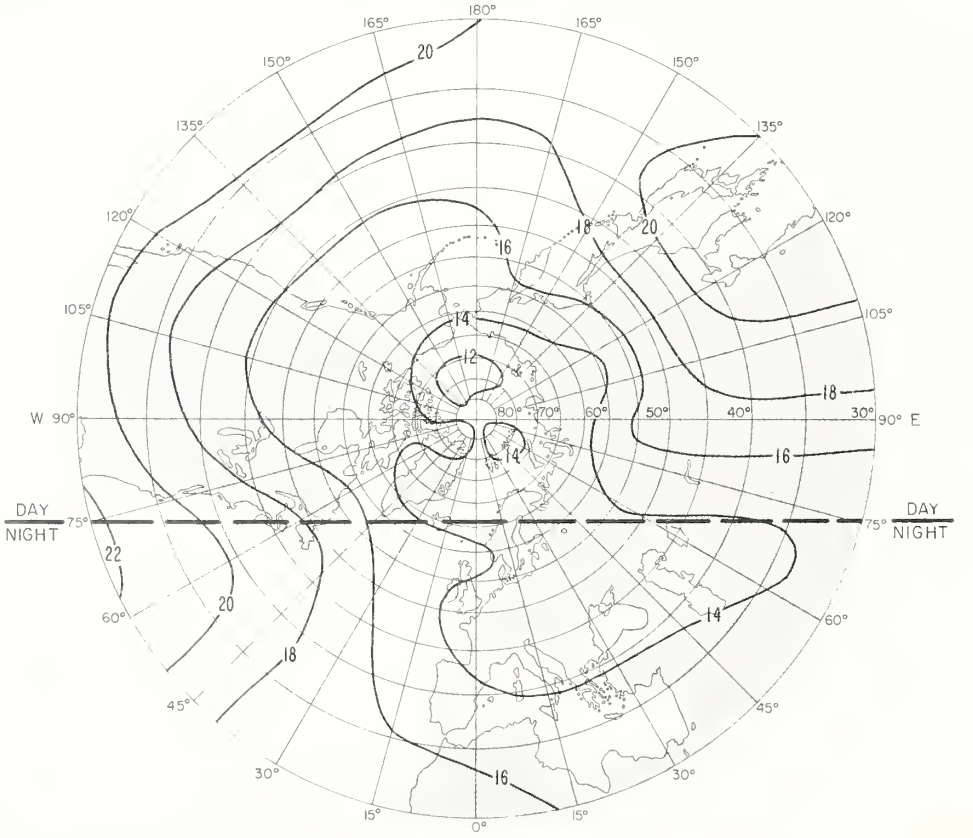

FIG. 13B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

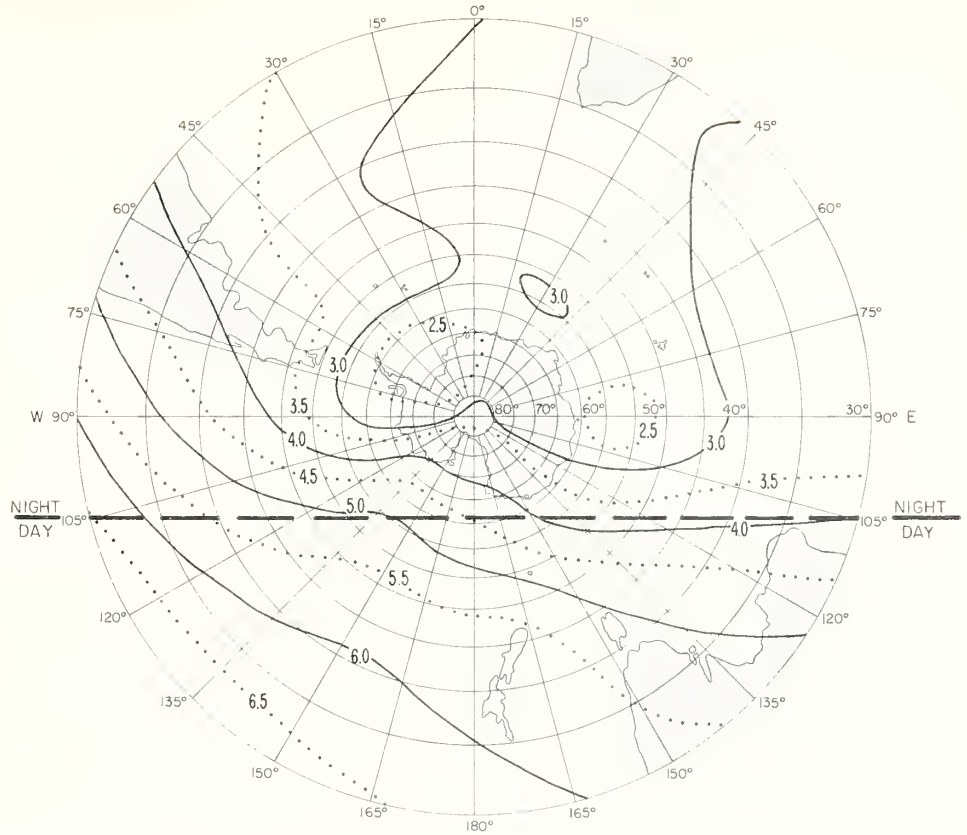

FIG. 14A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

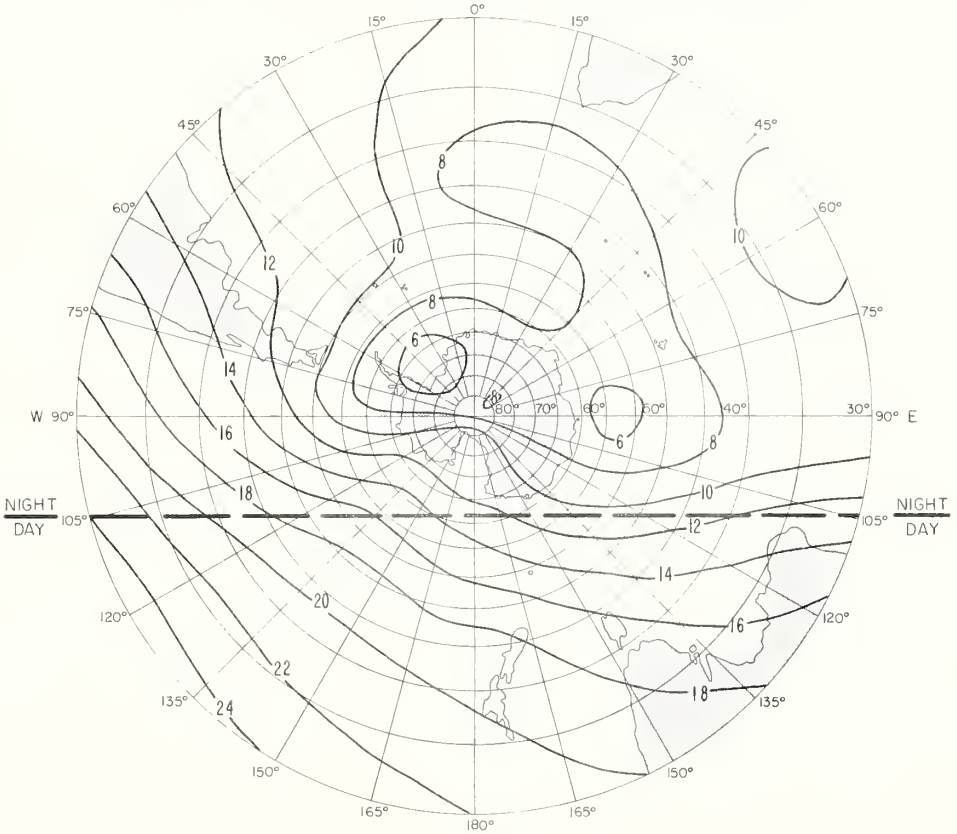

FIG. 14B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

NORTH POLAR AREA
JUNE 1964 UT=12

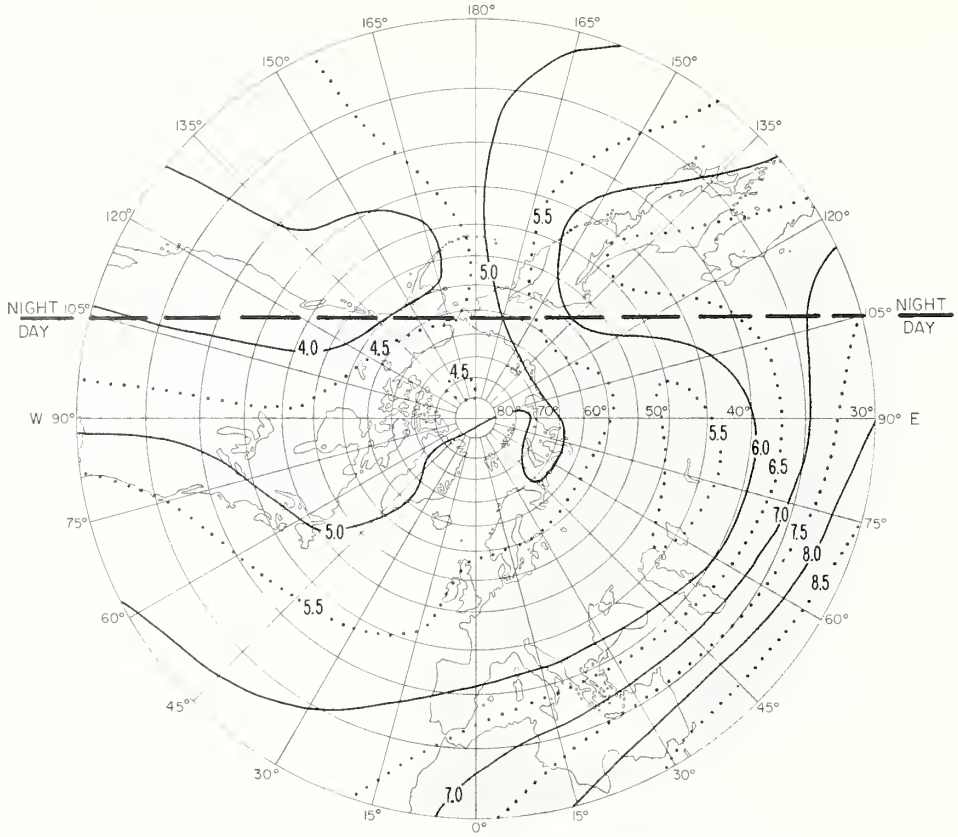

FIG. 15A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

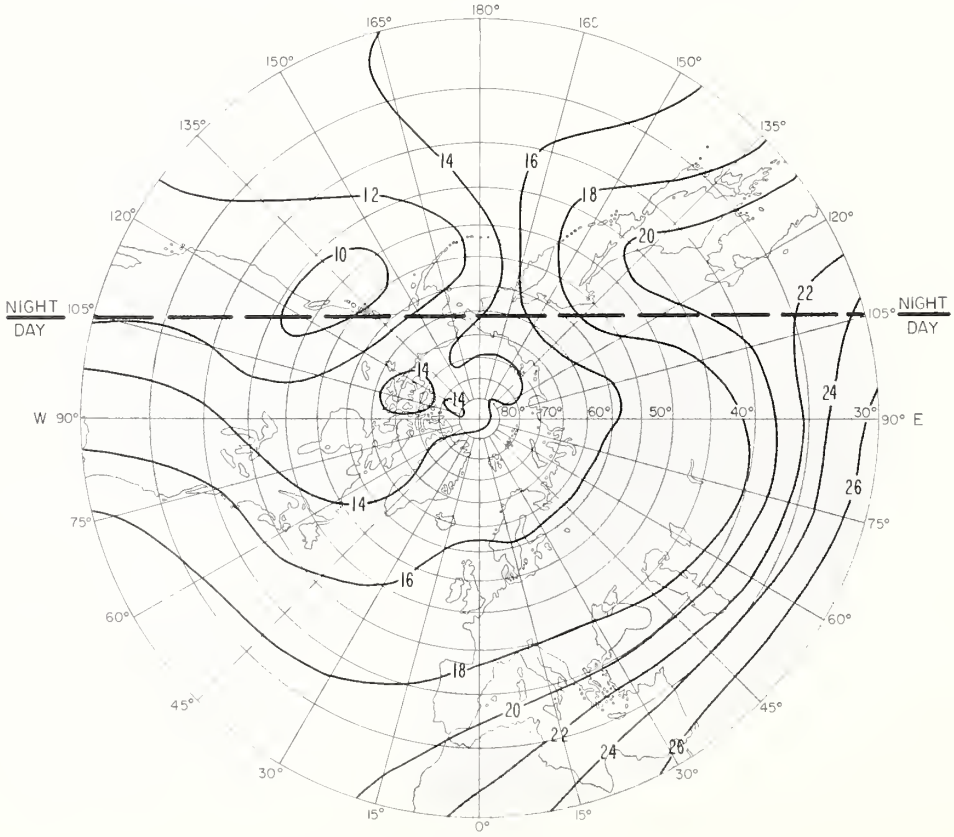

FIG. 15B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

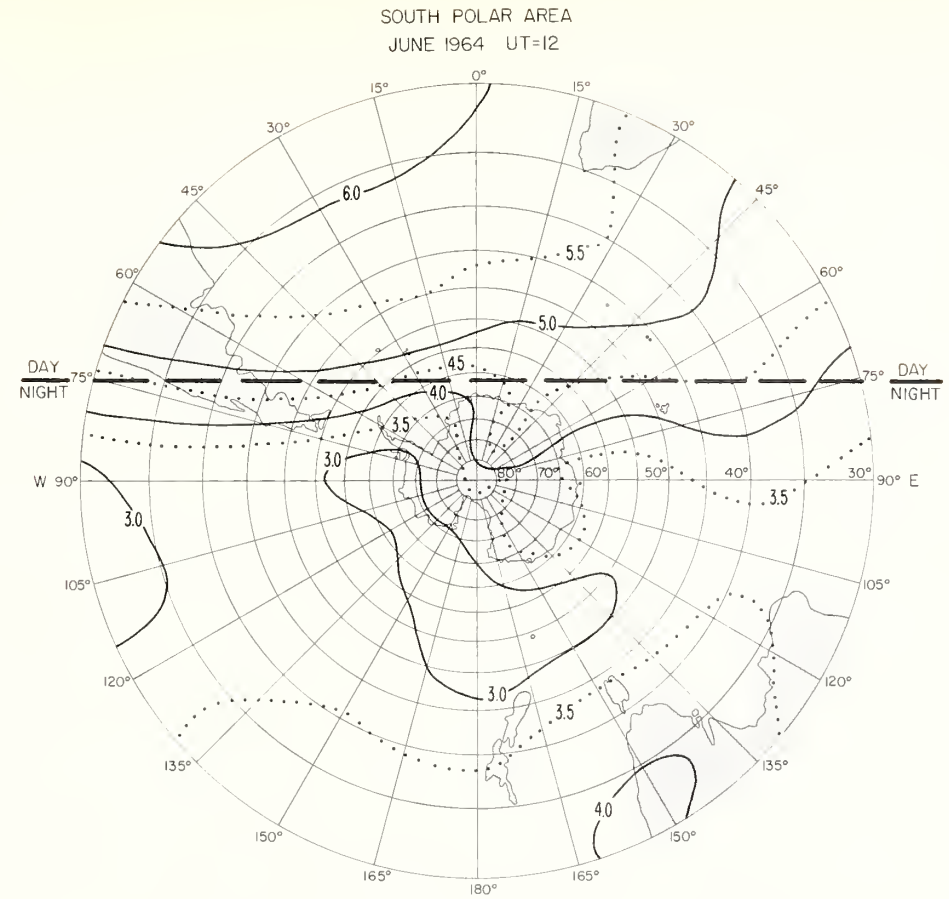

FIG. 16 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

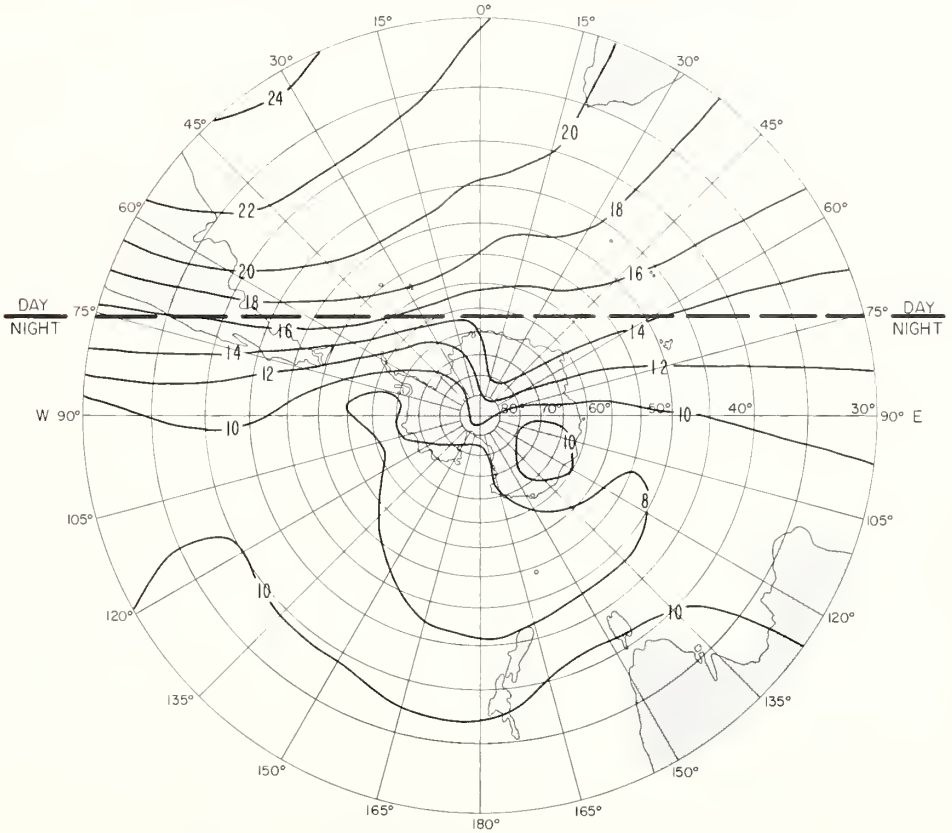

FIG. 16B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

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